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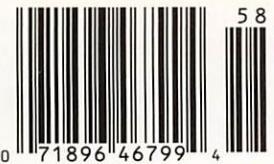
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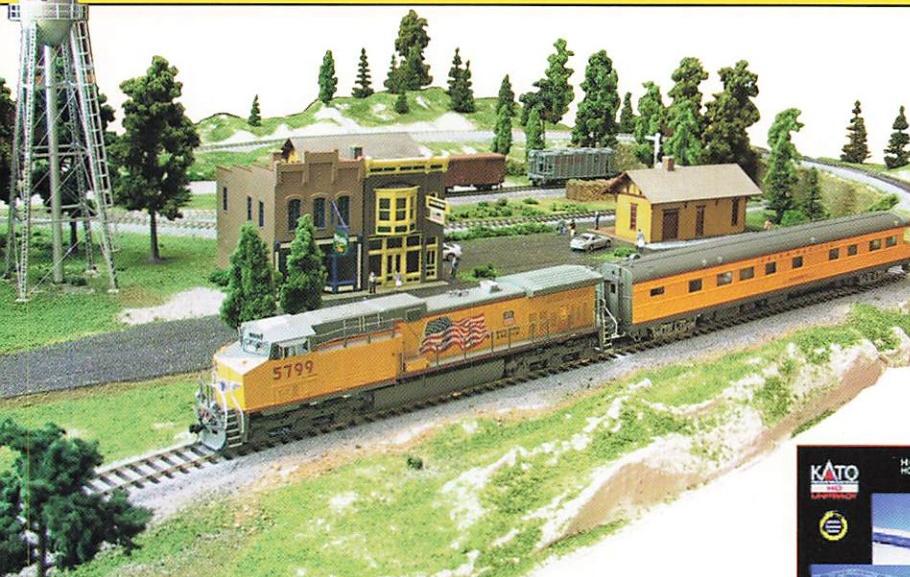
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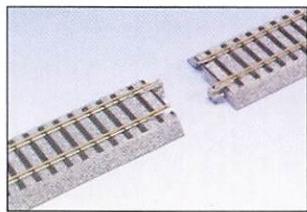


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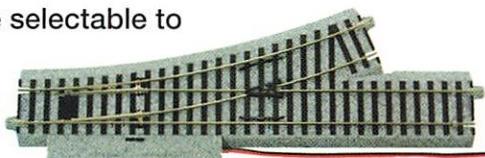
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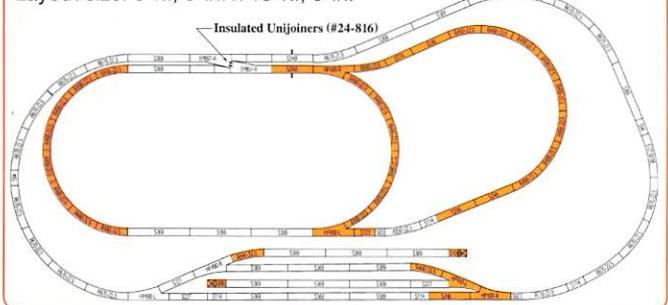
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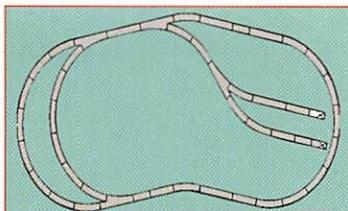
The **UNITRACK** System can easily support the growth of your layout.

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Layout size: 4-ft. x 8-ft.

Step 1: DC Operation

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MSRP \$65.00 • Pre-production sample shown.



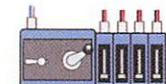
DC (Direct Current 12V) controller can control one train on a single track.

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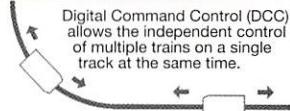
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Step 3: DCC Operation

Setting the turnouts to Non-power-Routing lets you enjoy DCC operation with the Digitrax Zephyr. The KATO Power Pack connects to the Zephyr for multiple train control.

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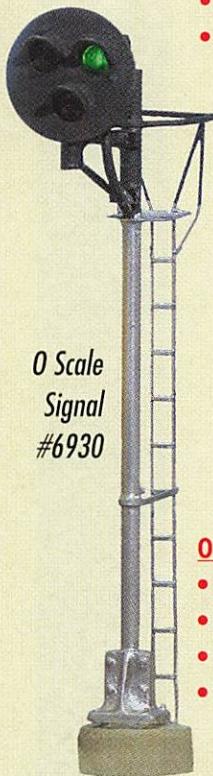
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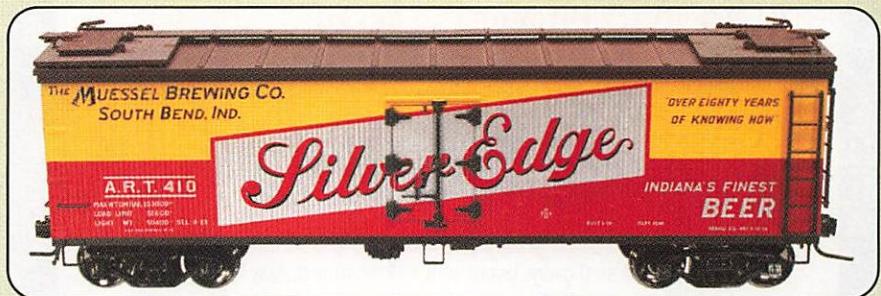
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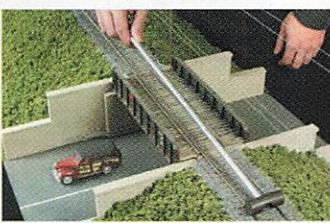
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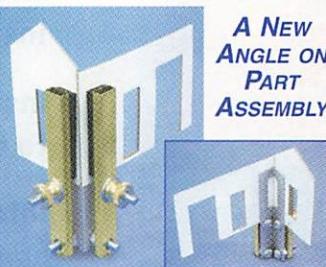
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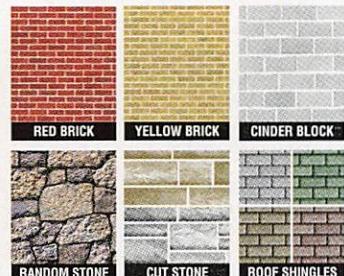
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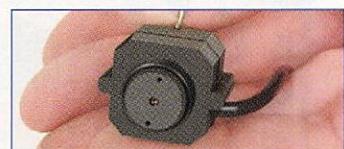
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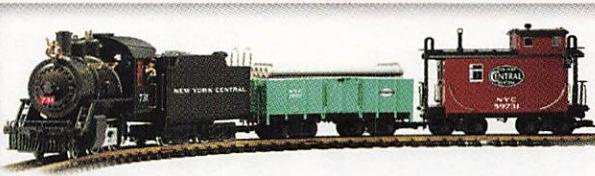
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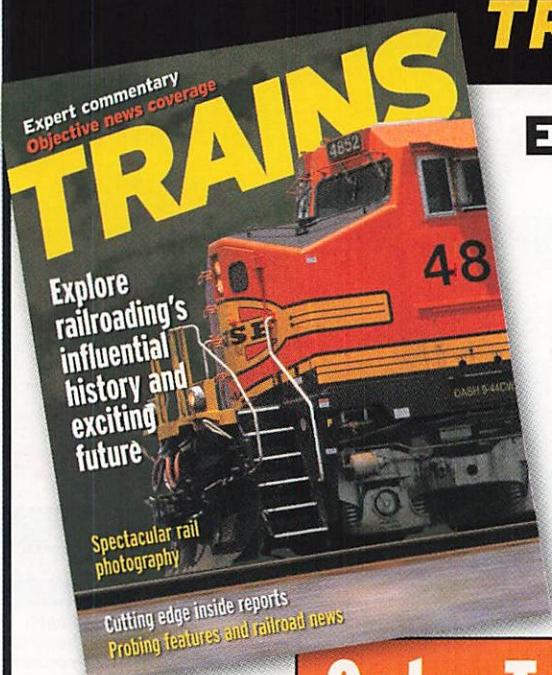
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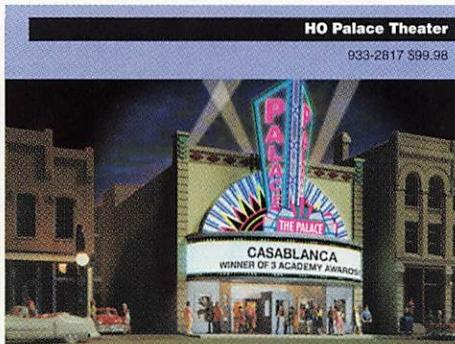
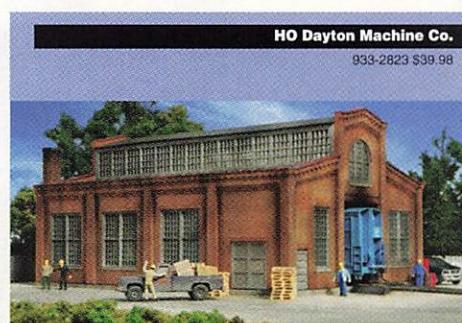
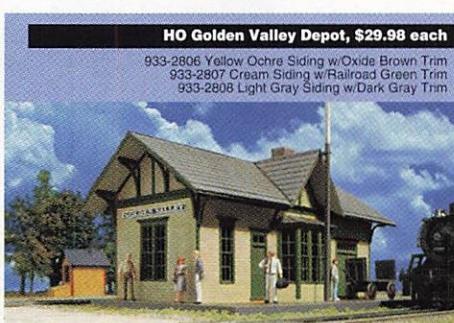
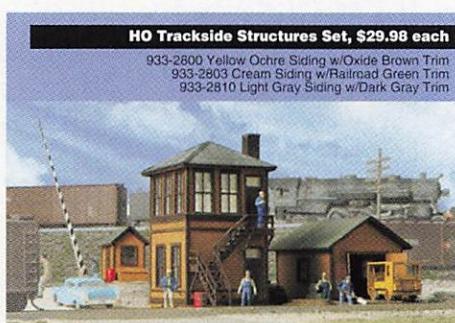
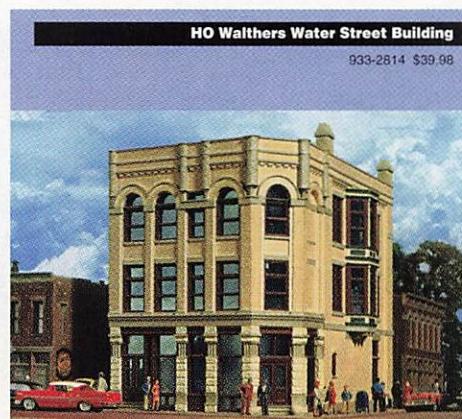
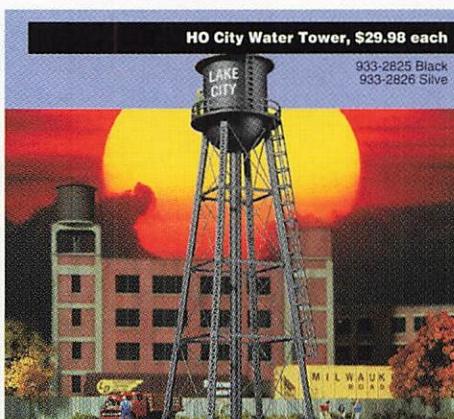
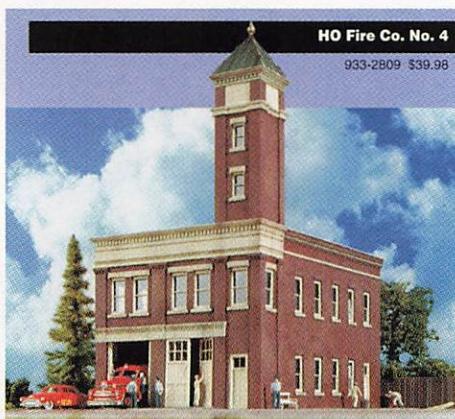
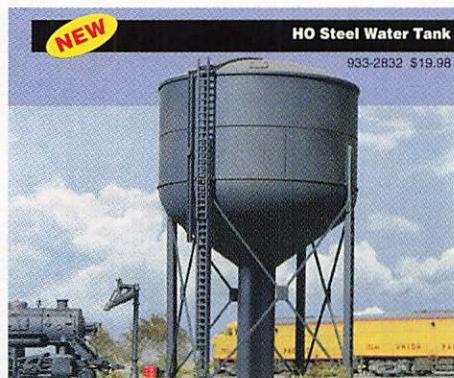
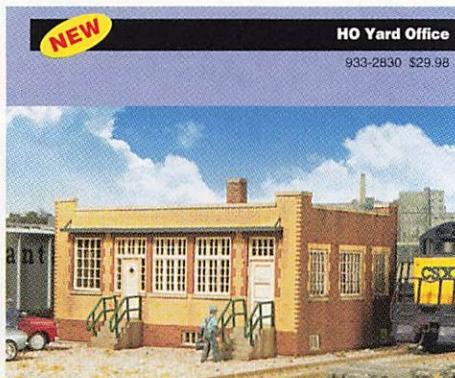
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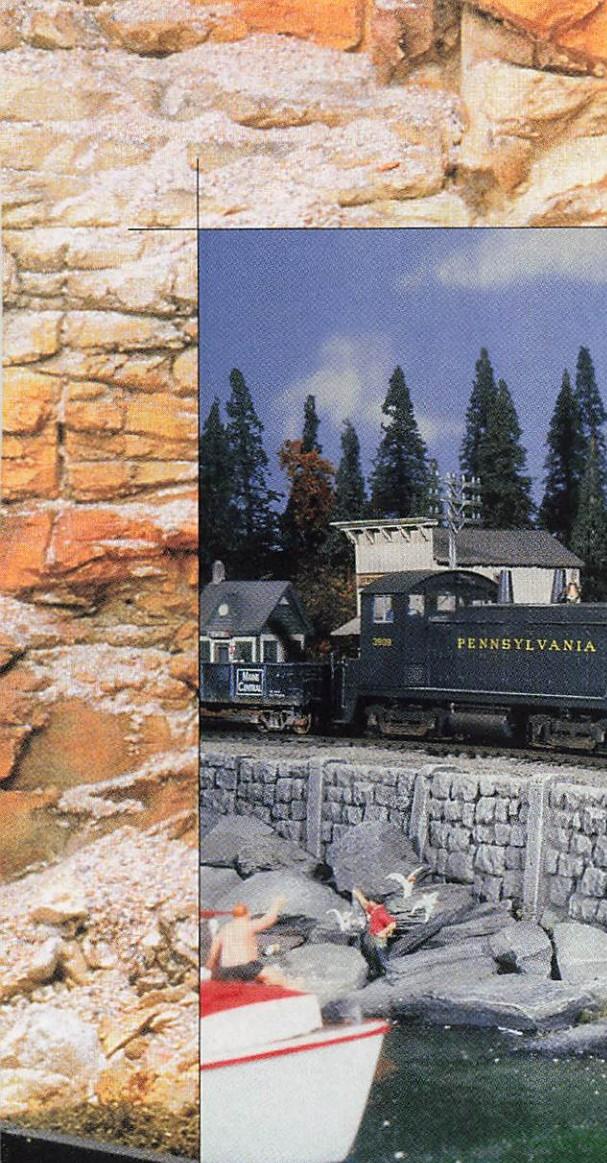
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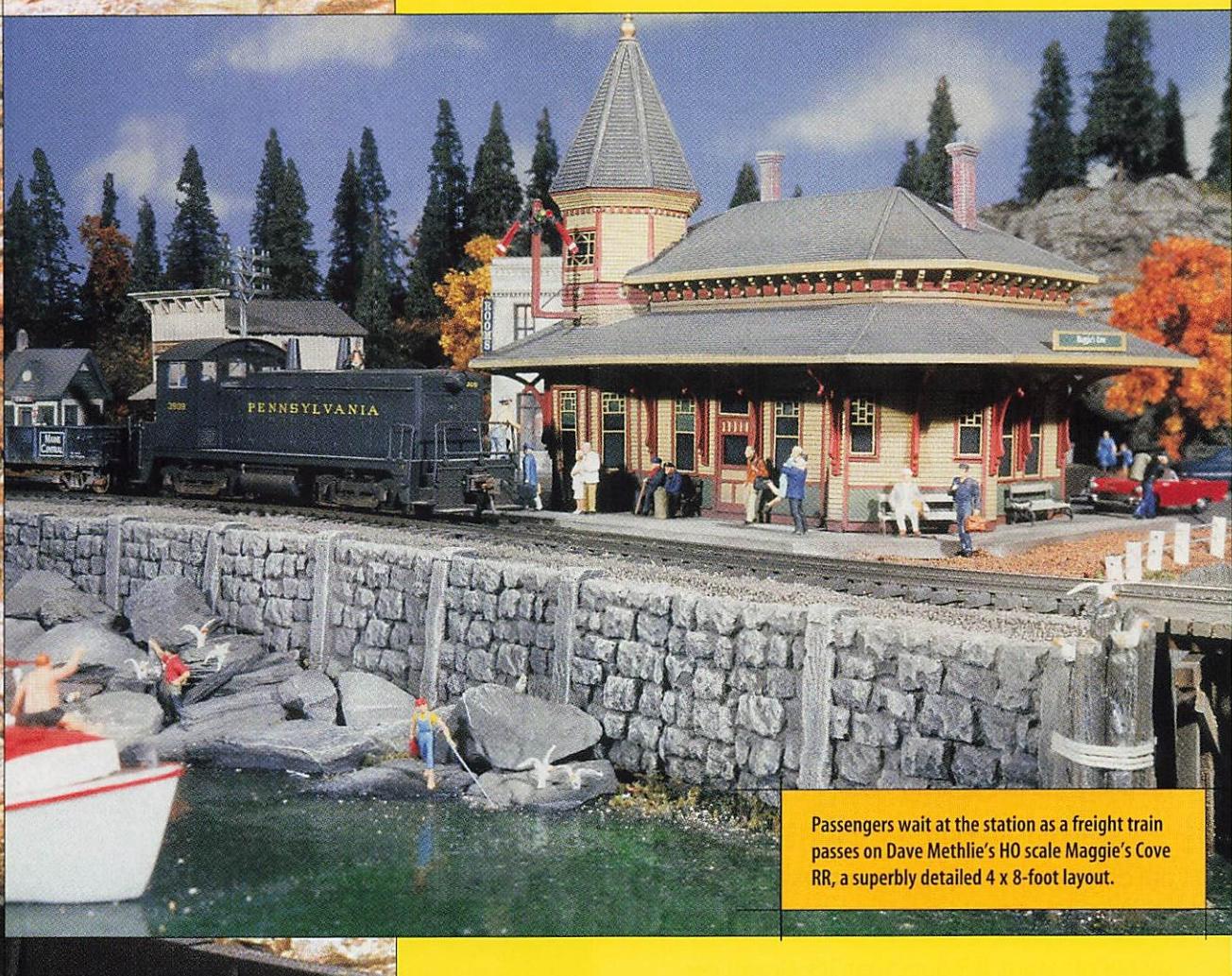
The Utah Belt is Eric Brooman's free-lanced HO railroad. Here, a long freight winds along the banks of the San Pedro River east of Benton, N.M. Eric is one of those rare modelers who can hand-carve plaster rocks that look as convincing as those cast in rubber molds. Eric, like the other modelers whose work is pictured here, started with a dream and made it a reality.



You can build
your
dream



Eric Brooman



Passengers wait at the station as a freight train passes on Dave Methlie's HO scale Maggie's Cove RR, a superbly detailed 4 x 8-foot layout.

Jim Forbes

rains. Now there's a word that conjures up countless images. A mile-long double-stack container train flying across a desert behind big, colorful diesels. A hundred coal cars slogging up the grades of the Appalachians behind a steam behemoth of the 1950s. Local trains of the 1920s making their leisurely way from one small town to the next in America's heartland. You get the picture. And the list could go on and on: narrow gauge through the Rockies; great passenger

trains like the *Super Chief*, *Broadway Limited*, *Hiawatha*, *Orange Blossom Special*, and a hundred more; long cuts of orange and yellow refrigerator cars bearing the fruits of western agriculture to eastern markets.

The accompanying photographs feature the work of highly accomplished modelers. But they all started with a few basic skills – many of which you will learn in the pages of this magazine – and a desire to create their own vision of railroading's drama.

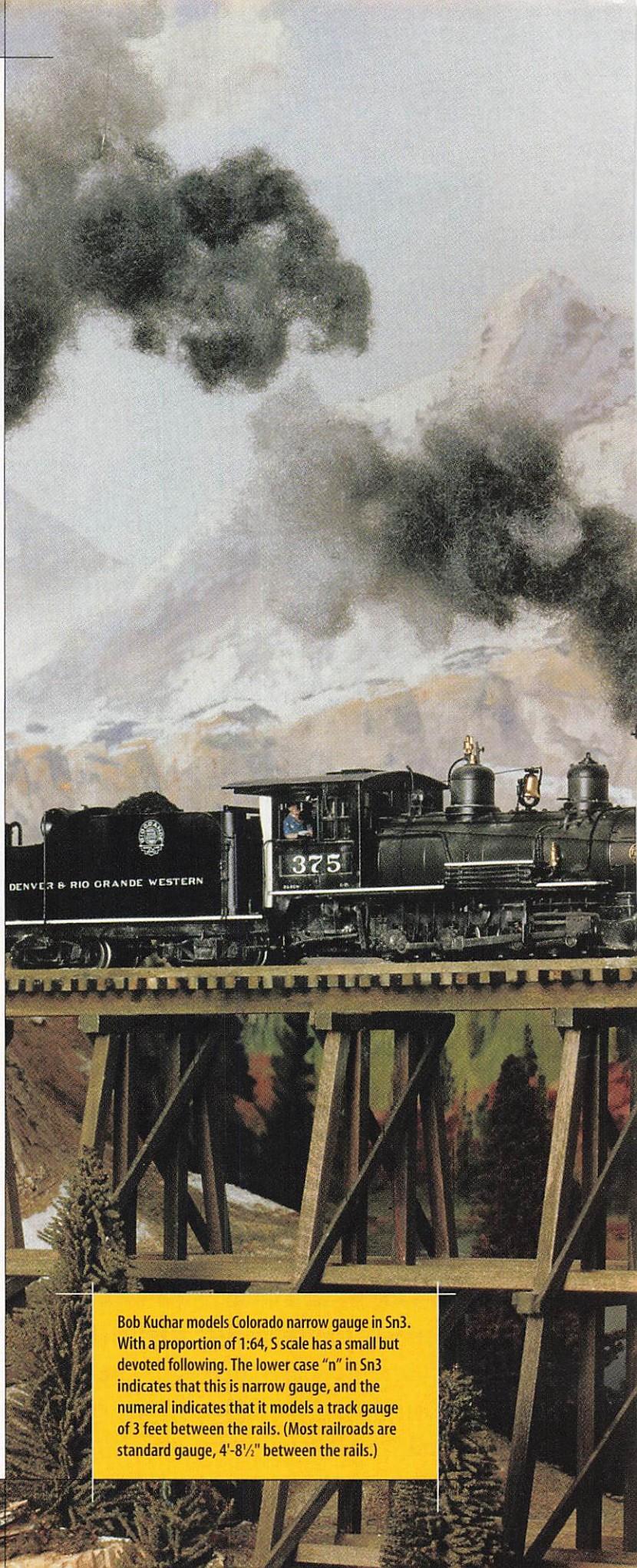
Given the history and geographic scope of railroading, it's no wonder there's such variety in *model* railroading. We can render any vision of railroading on our layouts, where the place and time is what we want them to be, right down to a particular day. Or we might prefer an attractive scenicked layout on which we can run any trains we like, any time we like. For many modelers the choice is highly personal. The layout may celebrate the real trains of the past or the present. For others, their layouts evoke the magical world of toy trains they knew as children. We're all model railroaders who share many common interests, but at the same time our visions are highly individual.

Individuality – that's what makes model railroads so fascinating. That's why you'll never see two layouts exactly alike. A successful model railroad can be a serious expression of meticulous craftsmanship and historical accuracy, or it can be wildly whimsical. All layouts are different, but defining a successful model railroad is pretty easy. It's a layout that gives its owner pleasure. If it does that, it's almost certain to please visitors too.

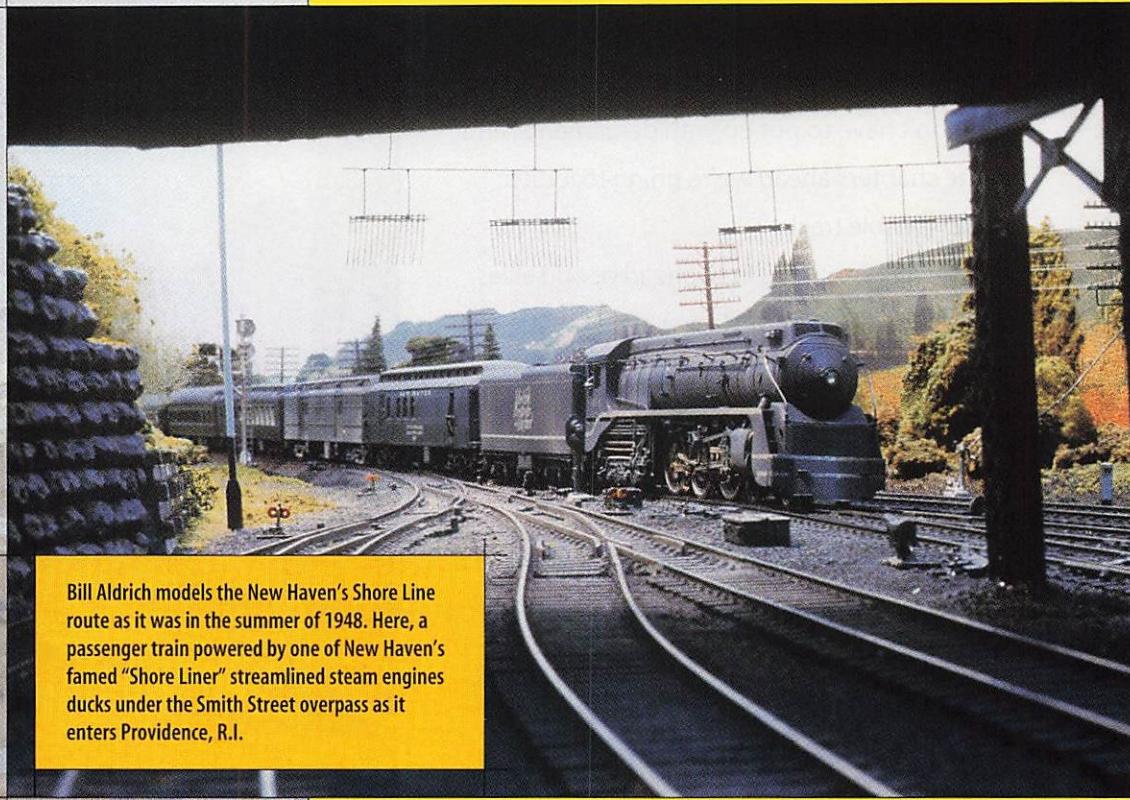
In *Model Trains Step by Step*, we'll present the basic information you need to build a pleasing model railroad – how to make a train table, choose track, install wiring, and create scenery.

Once we've covered the basics, we offer an in-depth look at the construction of eight great model railroads – each of which teaches additional skills. If you have a dream, we'll show you how you can build it.

Let's look at underlying principles of any model railroad. To succeed, your trains must run flawlessly. A layout can be beautiful to look



Bob Kuchar models Colorado narrow gauge in Sn3. With a proportion of 1:64, S scale has a small but devoted following. The lower case "n" in Sn3 indicates that this is narrow gauge, and the numeral indicates that it models a track gauge of 3 feet between the rails. (Most railroads are standard gauge, 4'-8½" between the rails.)

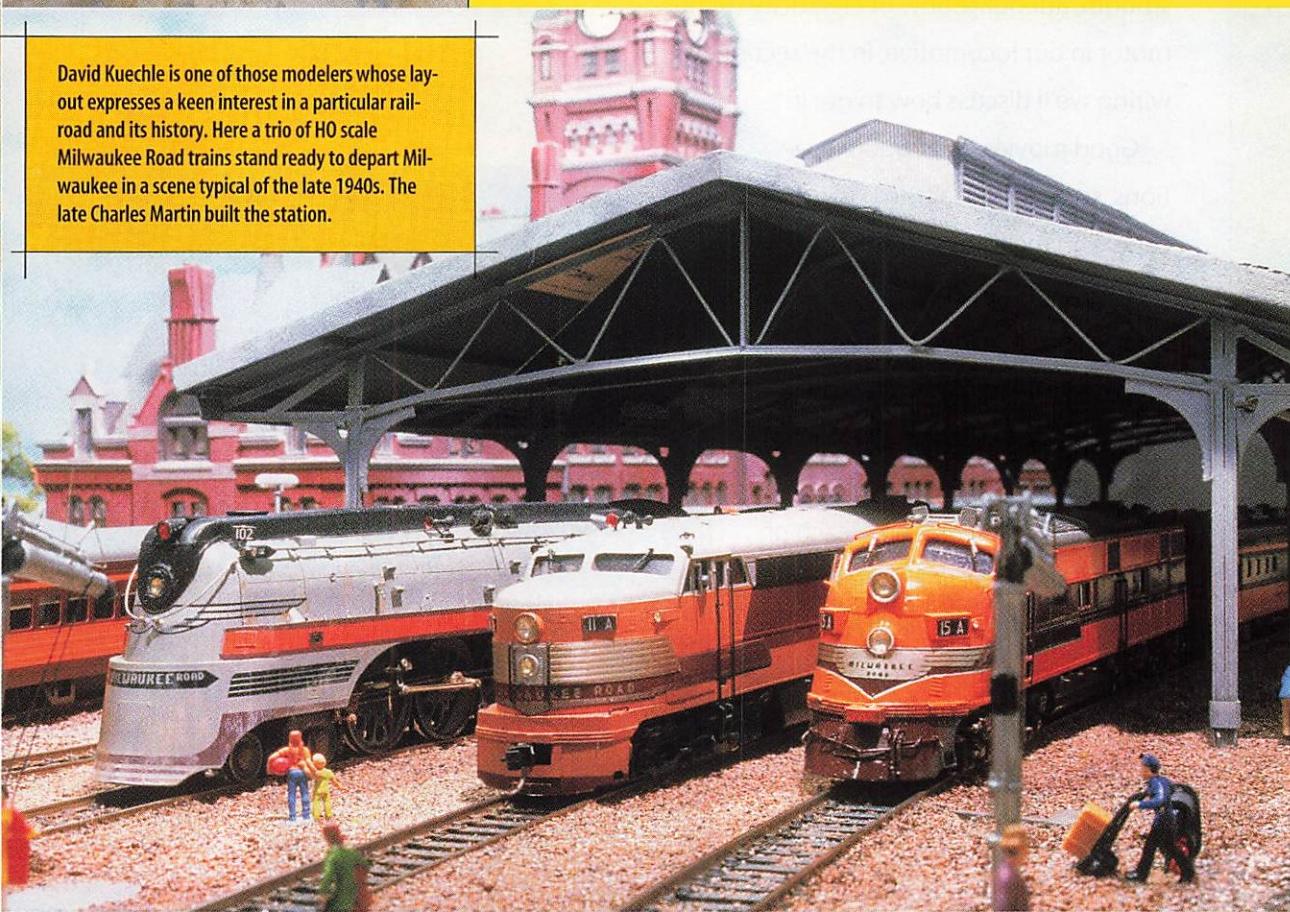


Bill Aldrich models the New Haven's Shore Line route as it was in the summer of 1948. Here, a passenger train powered by one of New Haven's famed "Shore Liner" streamlined steam engines ducks under the Smith Street overpass as it enters Providence, R.I.

Paul J. Dolkas

David Kuechle is one of those modelers whose layout expresses a keen interest in a particular railroad and its history. Here a trio of HO scale Milwaukee Road trains stand ready to depart Milwaukee in a scene typical of the late 1940s. The late Charles Martin built the station.

David Kuechle



at, but it can't sustain the image if the trains don't stay on the track. It's like trying to watch a movie while the projector keeps breaking. You shouldn't have to put up with derailments, and in the chapters ahead we're going to look at laying reliable track.

But we've gotten a little ahead of ourselves. You can be the best tracklayer ever, but it won't help if the track isn't supported on a firm, worry-free base. Any railroad man can tell you that good track starts with a proper right-of-way. For model railroaders that means trustworthy benchwork, so we'll be starting there.

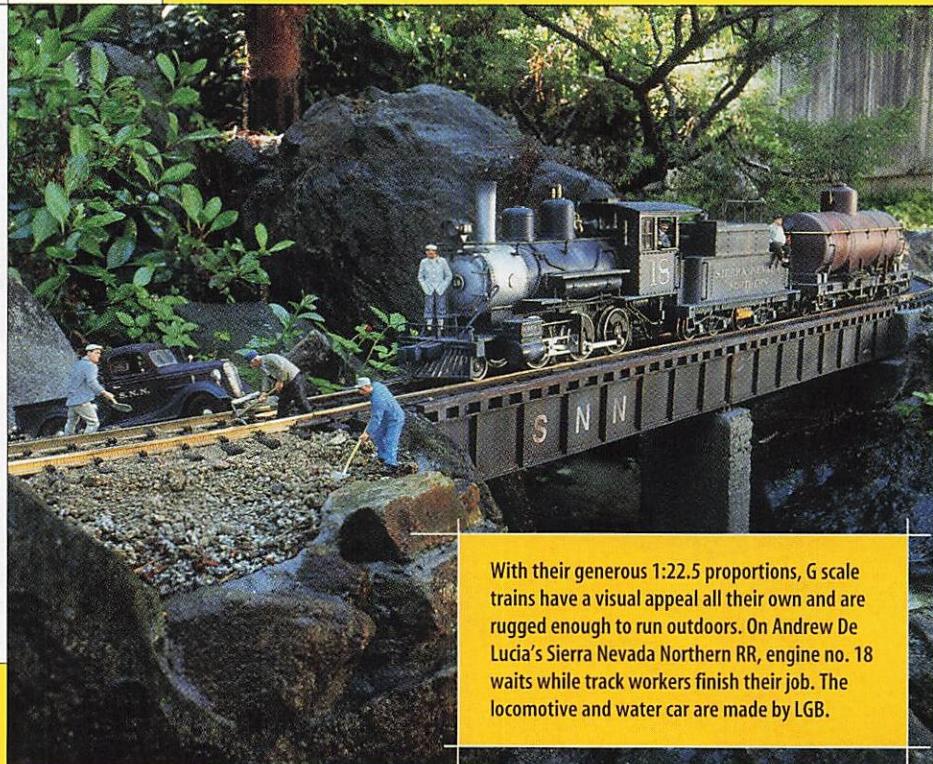
Once our trains are staying on the track we want them to move smoothly. Herky-jerky motion destroys the illusion. Our movie frames are jumping. We need a smooth, adequate flow of electricity to the motor in our locomotive; in the section on wiring we'll discuss how to get it.

Good movies need good locations, so we'll look at the basic concepts and techniques for building scenery. After that we'll see these fundamentals applied to several model railroads you can build.

The photographs on these pages show you what their builders accomplished. At one time each of these layouts was only a dream. Now they can be shared to help inspire the dreams of others. Take a moment to enjoy them – then let's get started on your layout. #

The arid Southwest inspired this desert-themed Santa Fe Ry. layout, which combines three-rail O gauge trains and realistic scenery. This railroad was built by the staff of *Classic Toy Trains* magazine.

Jim Forbes



With their generous 1:22.5 proportions, G scale trains have a visual appeal all their own and are rugged enough to run outdoors. On Andrew De Lucia's Sierra Nevada Northern RR, engine no. 18 waits while track workers finish their job. The locomotive and water car are made by LGB.

Andrew De Lucia

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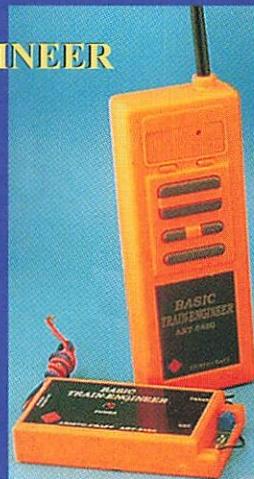
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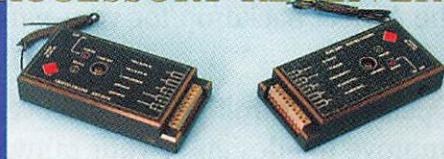
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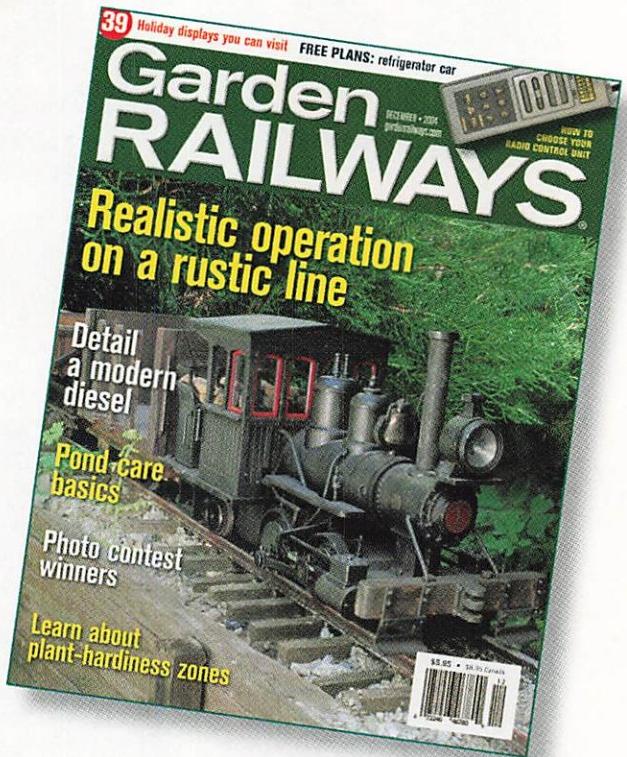
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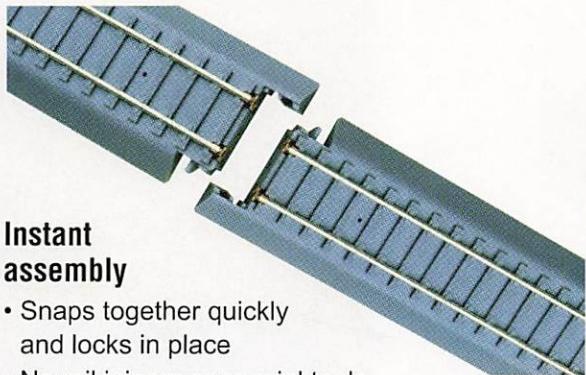
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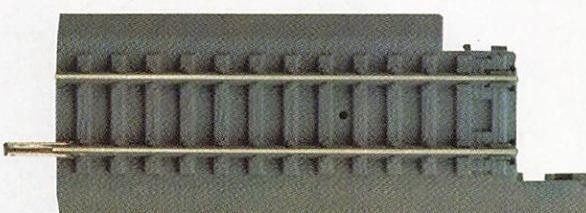
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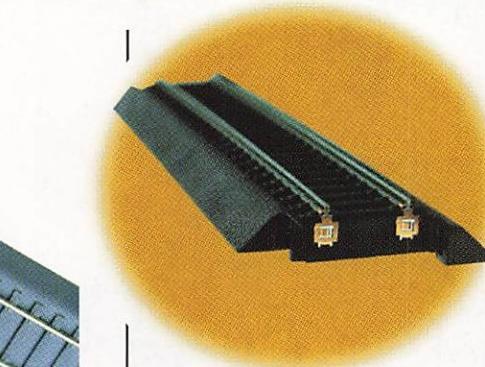
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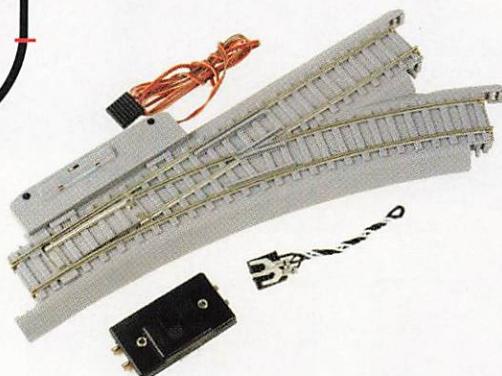
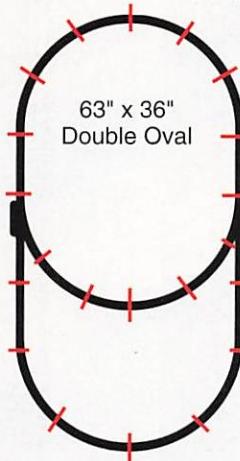


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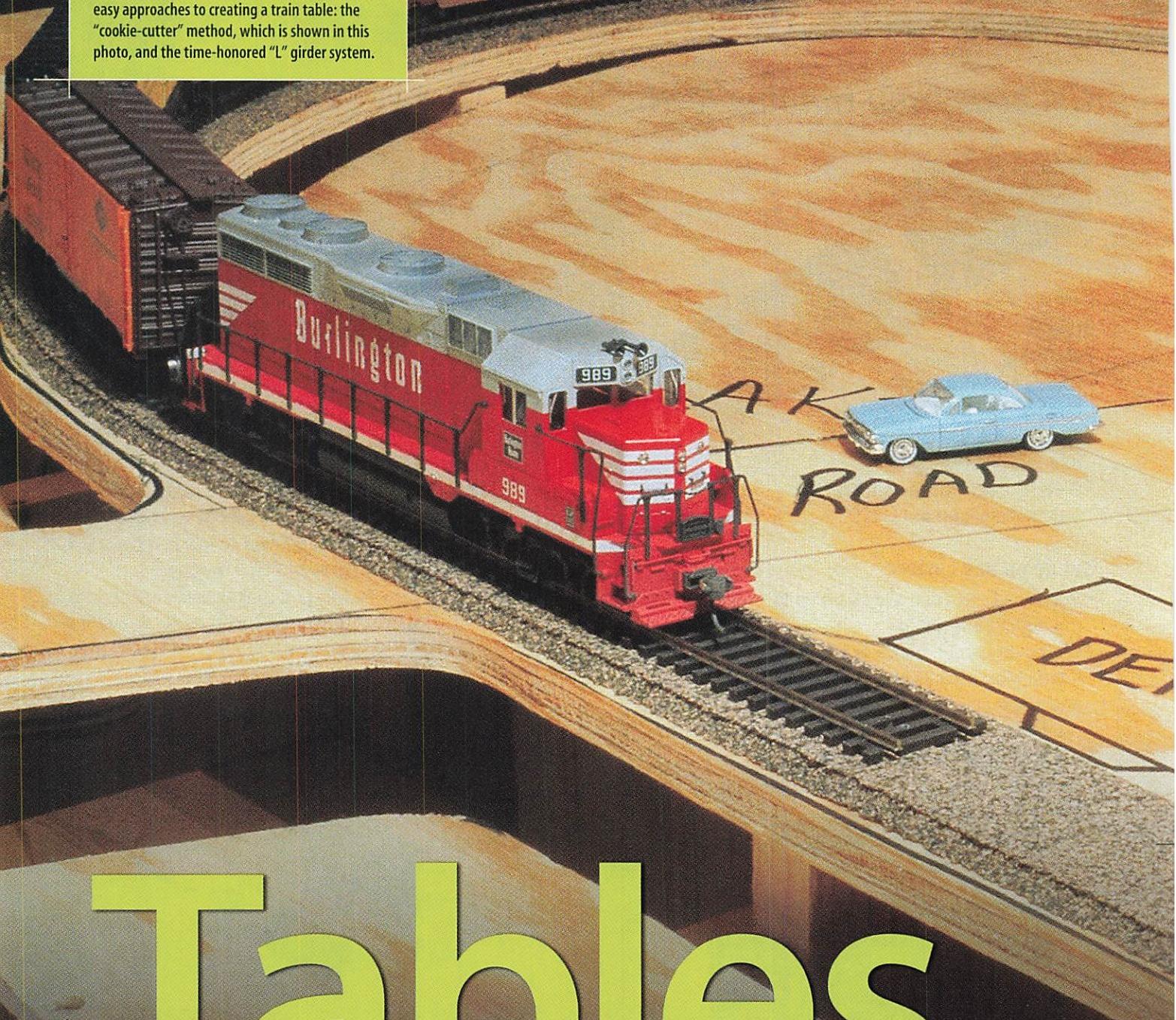
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A good model railroad starts with a rock-solid surface. If you don't want to use the floor, you'll need a sturdy train table. In this chapter, we'll show you how to build a simple 4 x 8-foot table, illustrated at right. We'll also describe two other easy approaches to creating a train table: the "cookie-cutter" method, which is shown in this photo, and the time-honored "L" girder system.



Tables for your trains

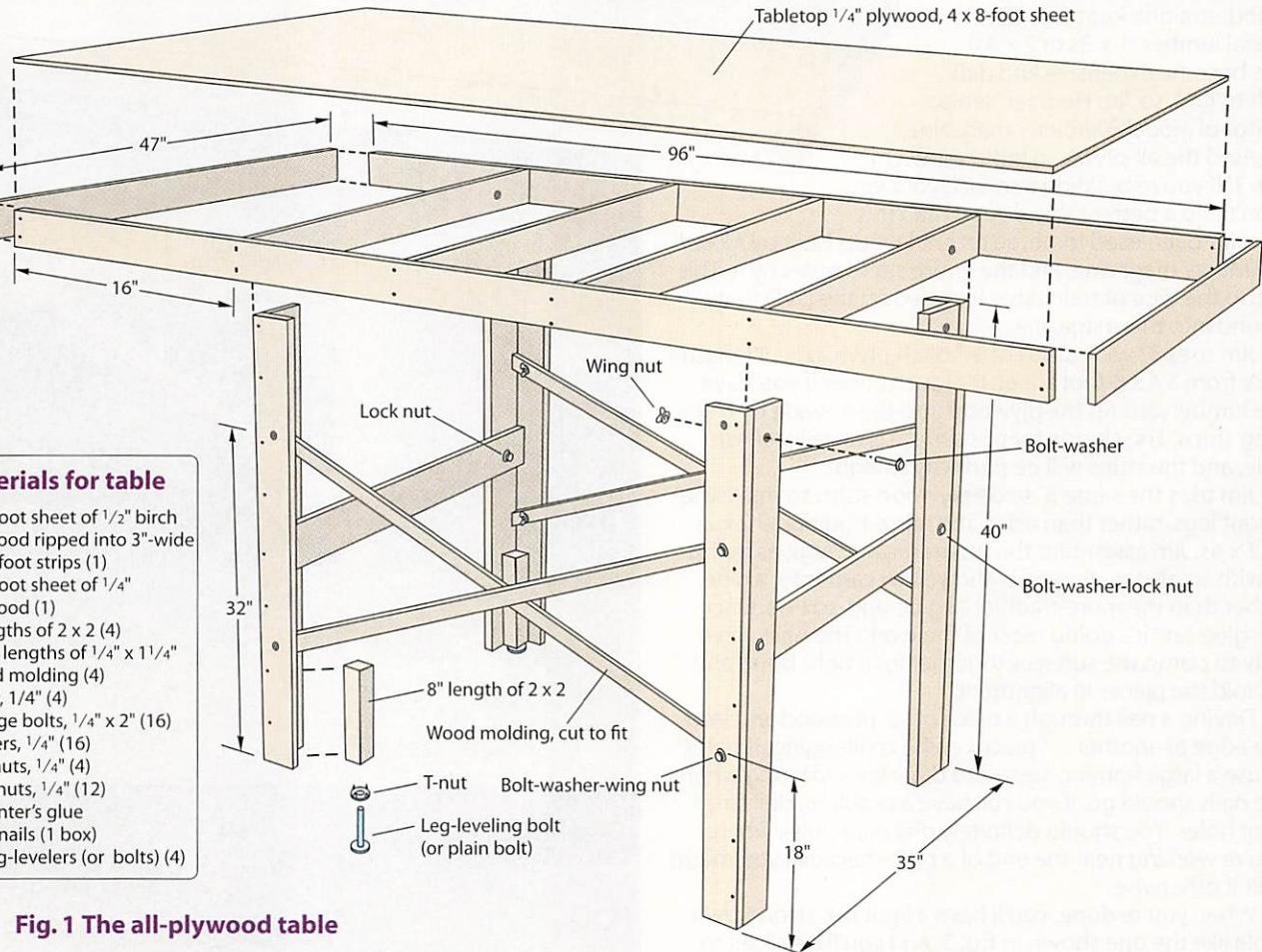
Good construction now will lead to good performance later



Materials for table

4 x 8-foot sheet of $\frac{1}{2}$ " birch plywood ripped into 3"-wide by 8-foot strips (1)
4 x 8-foot sheet of $\frac{1}{4}$ " plywood (1)
8" lengths of 2 x 2 (4)
8-foot lengths of $\frac{1}{4}$ " x $1\frac{1}{4}$ " wood molding (4)
T-nuts, $\frac{1}{4}$ " (4)
Carriage bolts, $\frac{1}{4}$ " x 2" (16)
Washers, $\frac{1}{4}$ " (16)
Lock nuts, $\frac{1}{4}$ " (4)
Wing nuts, $\frac{1}{4}$ " (12)
Carpenter's glue
Panel nails (1 box)
 $\frac{1}{4}$ " leg-levelers (or bolts) (4)

Fig. 1 The all-plywood table



In this section, we'll show you how to build a simple and sturdy train table that's perfect for just about any 4 x 8-foot model railroad, and we'll also take a look at a couple of other table designs that are definitely worth considering – particularly if you want dramatic scenery effects such as a deep valley below track level.

There are many different ways to support your railroad, and they all fall under the general heading of "benchwork." Bench-

work can be just about anything. We've heard of one modeler who uses the top of his piano for his railroad so he can enjoy his two favorite activities in the same room. Another fellow we know built his basement-sized railroad empire using supports made of structural steel. He was a metal-framing contractor, and for him steel was the easiest and most natural choice. The materials and techniques are not important as long as your benchwork gets the job done.

The train table is a means to an end. We want to build it carefully and well, but we also want to move on fairly quickly to running some trains.

The all-plywood train table

Good, straight, knot-free dimensional lumber (1 x 3s or 2 x 4s) has become expensive and difficult to find, so Jim Hediger, senior editor of *Model Railroader* magazine, devised the all-plywood table shown in **fig. 1**. If you're building a small layout you won't find a better table design than this one. It's been used for three recent layouts built by *Model Railroader* magazine, and the entire staff swears by it. This is also the type of train table featured on the DVD that's bound into this magazine.

Jim uses 3"-wide strips of $\frac{1}{2}$ " birch plywood cut lengthwise from a 4 x 8-foot sheet. It's much easier if you have the lumberyard rip the plywood into the 3"-wide by 8'-0"-long strips. The charge for this service is usually reasonable, and the strips will be perfectly straight.

Jim uses the same 3"-wide plywood strips to make the layout legs, rather than using the more-traditional 2 x 2s or 2 x 4s. Jim assembles the top frame and legs, as in **fig. 2**, with small paneling nails and yellow carpenter's glue, rather than the more-traditional glue-and-screws. Once the glue sets it's doing most of the work. The nails serve only to clamp the surfaces together for a tight bond and to hold the pieces in alignment.

Driving a nail through a piece of $\frac{1}{2}$ " plywood and into the edge of another $\frac{1}{2}$ " piece can be challenging. It helps to use a large framing square to draw lines locating where the nails should go. If you still have a problem, drill small pilot holes. You should definitely drill pilot holes when you're working near the end of a piece because you might split it otherwise.

When you're done, you'll have a light but strong train table like the one shown in **fig. 3**, and you'll be all set to install the legs, as Jim is doing in **fig. 4**.

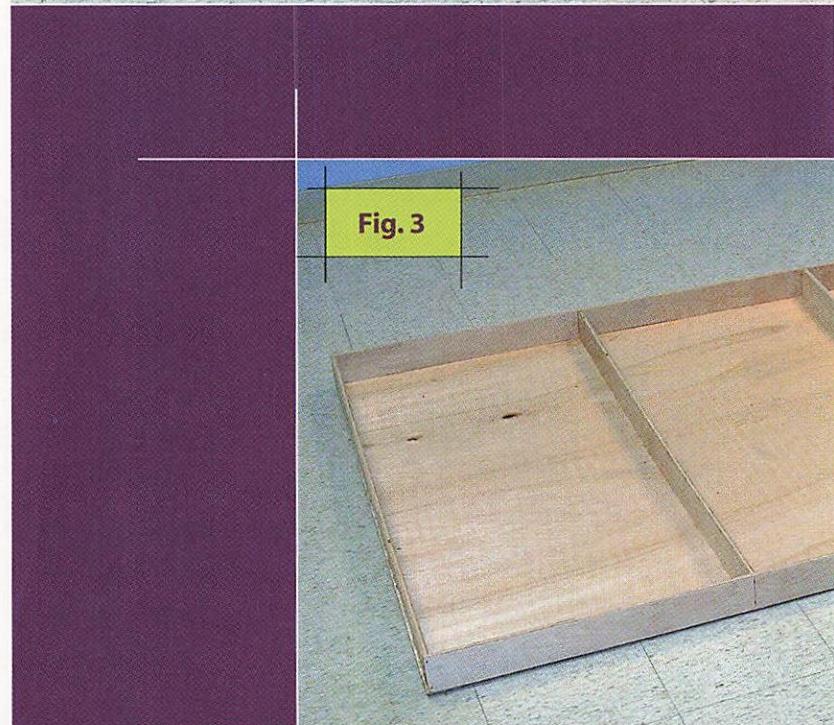
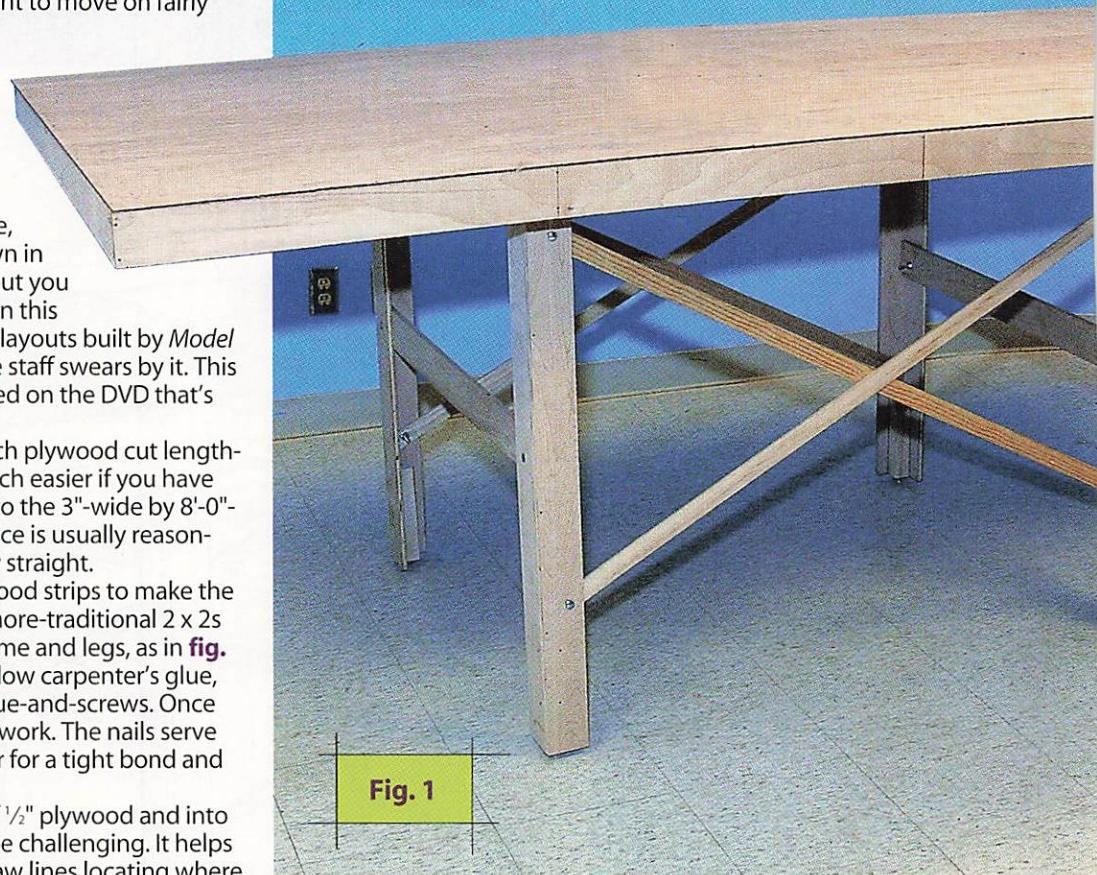
"Cookie-cutter" tables

For larger layouts we often use more versatile designs to conserve material and provide more latitude for scenery construction. They may seem complicated at first glance, but they are actually easy to build. The first of these, shown in **fig. 5**, is called a "cookie-cutter" train table.

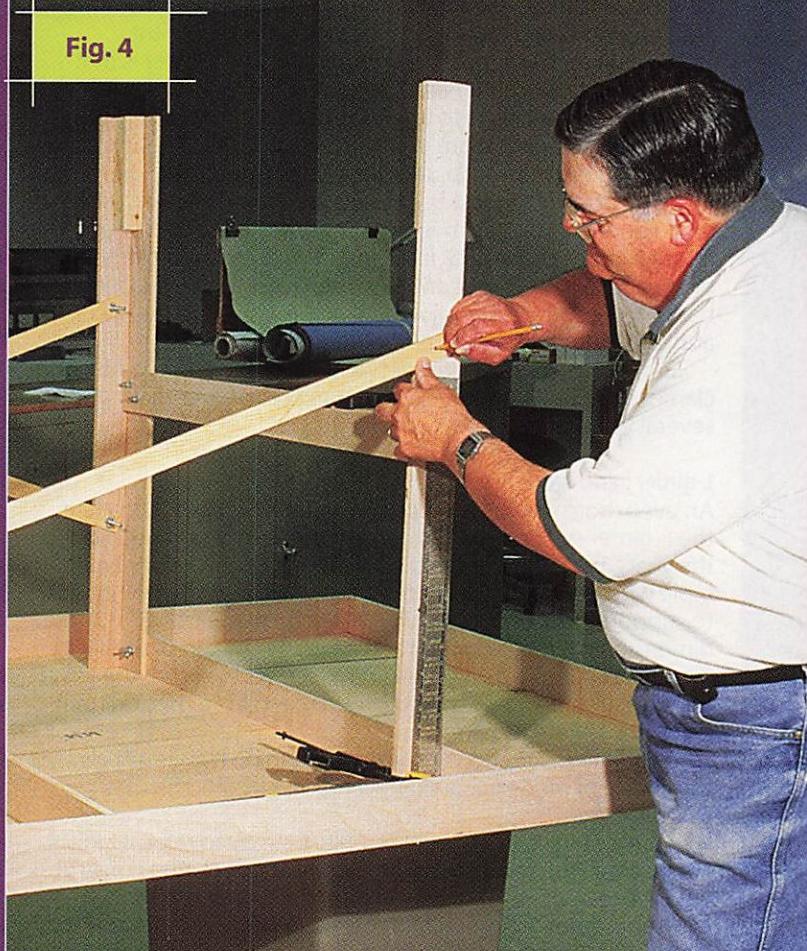
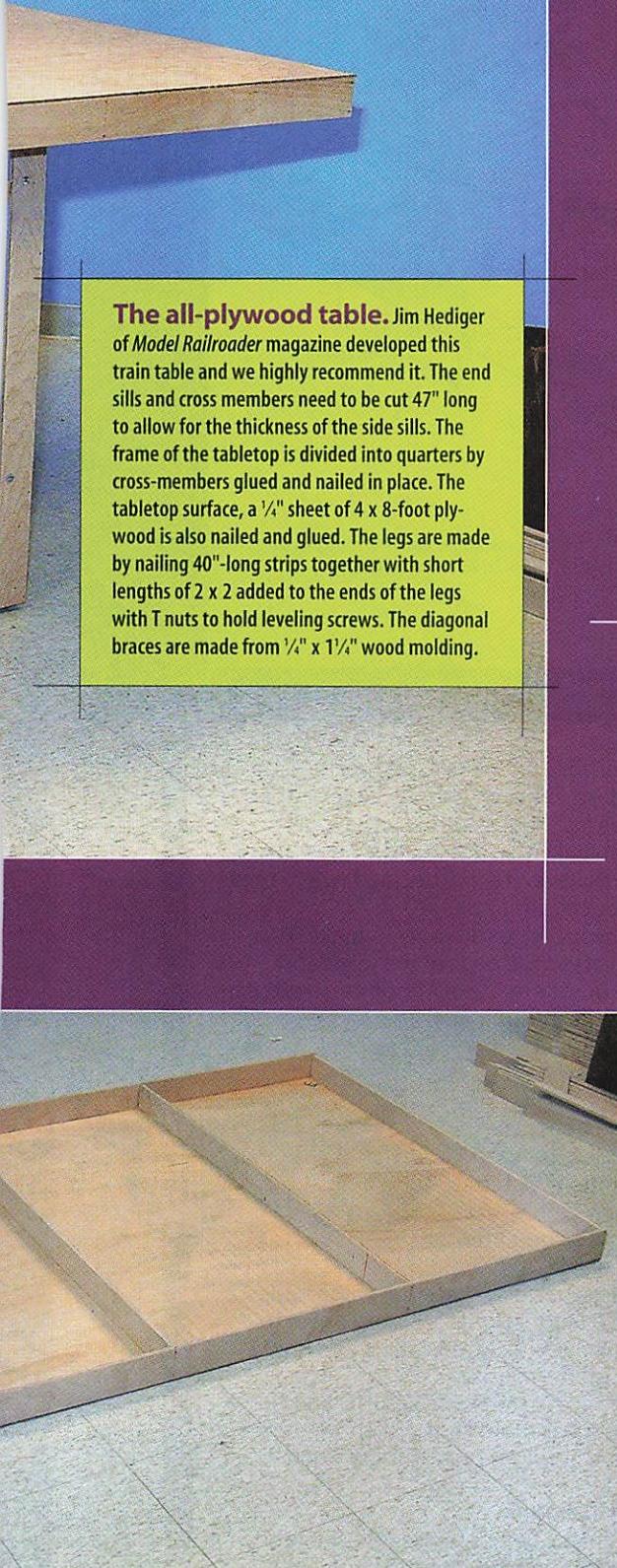
Basically a cookie-cutter is a method of cutting a single sheet of plywood to form ribbon track boards (which we'll call "subroadbed" from here on) at different levels above the table grid. The subroadbed is supported on risers secured to the cross-pieces, usually called "joists."

This allows us to build dramatic scenery both below and above track level and eliminates those planes of plywood in places where they really aren't needed – under mountains for example. This is not a major consideration on a small layout, but it can save money on a large one.

If someday you decide to pursue this joist-and-riser style of construction, start checking sales flyers for really good deals on clamps, and stock up. We're not kidding. You'll want a dozen, or maybe even more. See **fig. 6**. A C-clamp is a beautiful thing, and we modelers have always loved them, but the clasp-type clamps widely available



The all-plywood table. Jim Hediger of *Model Railroader* magazine developed this train table and we highly recommend it. The end sills and cross members need to be cut 47" long to allow for the thickness of the side sills. The frame of the tabletop is divided into quarters by cross-members glued and nailed in place. The tabletop surface, a $\frac{1}{4}$ " sheet of 4 x 8-foot plywood is also nailed and glued. The legs are made by nailing 40"-long strips together with short lengths of 2 x 2 added to the ends of the legs with T nuts to hold leveling screws. The diagonal braces are made from $\frac{1}{4}$ " x $1\frac{1}{4}$ " wood molding.



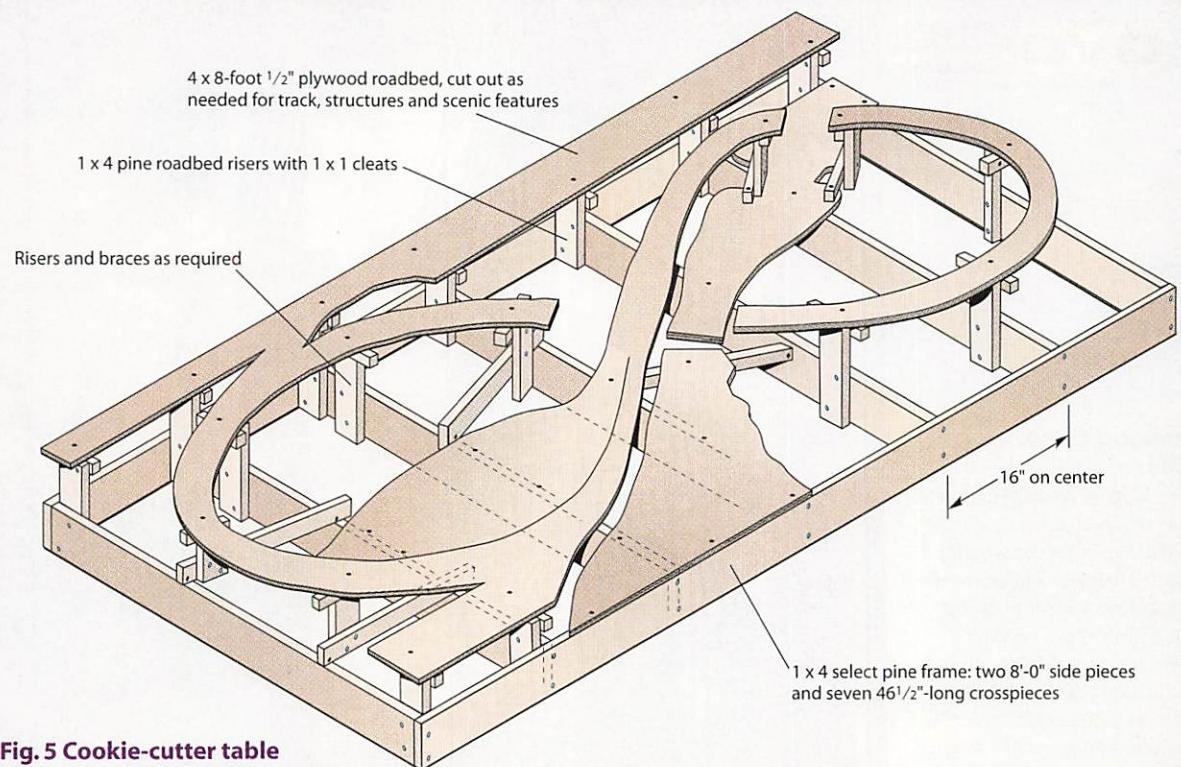


Fig. 5 Cookie-cutter table

nowadays cost less than half as much, attach almost instantly, and have no rotary motion to throw off your alignment.

"Why all these clamps?" you might ask. The answer is that they allow us to position risers temporarily. Once we're satisfied we can attach the risers to the joists permanently with 1" drywall screws, running them in with an electric drill. These are thin screws that can snap, so always wear eye protection.

It's a good idea to just use screws, no glue – because even after you think you've arrived at a riser's final location, you might want to come back later and make further adjustments or even revise the layout entirely. Then it's a simple matter of backing out the screws, relocating and reclamping the risers, and screwing them back on.

Sometimes model railroaders wait so long before removing clamps that they forget a few and don't rediscover them until several years later!

L-girder benchwork

An even more flexible method is illustrated in [fig. 7](#). It's called the L-girder system and has become extremely popular over the years. Basically, the L-girder system is an open-grid train table with the sills removed from the sides and moved inboard to support the joists from below. A flange made from 1 x 3 dimensional lumber is glued and nailed to the top of the sill to provide a lip into which we can drive screws to secure the joists. It also results in an L-shaped girder (as seen from the end) that gives this system its name.

L-girder construction or some variation on it is almost always the choice of modelers building large layouts and has many advantages:

- The system is extremely versatile. It's easy to relocate joists and risers if you decide to make modifications during construction or later.
 - The system requires a minimal amount of material and so it's an economical choice for a large layout.

- Carpentry does not have to be precise, as there are no butt joints as with the table-shaped systems we've just discussed. In fact, layout builders often make the joists a little longer than required if they haven't quite decided where they want the layout edges to be.

- Curved layout edges are easy to make. You just attach cleats to the ends of the joists and screw profile boards made of Masonite, sheet plastic, or a similar flexible material to the joist-end cleats.

Layout height

Particularly in the smaller scales (HO and N) we can enjoy the trains more if they're up where we can view them. Sternum-high is about right.

A pleasant environment

One of the ironies of model railroads is that they take away space and then give it back. All that space under the layout can be used for storage, but if you do that we would certainly recommend dressing up the layout with drapery. Piles of boxes aren't an attractive sight, and you want your layout and surroundings to be a pleasant place where you and others will enjoy many relaxing hours. #



READ MORE ABOUT IT

You could write a book about model railroad benchwork, and two authors have: Linn Westcott and Jeff Wilson. Linn's *How to Build Model Railroad Benchwork* is a classic written 25 years ago that has been updated by Rick Selby, and Jeff's *Basic Model Railroad Benchwork* is a recent offering. Both are excellent and are available from Kalmbach Publishing Co.

Fig. 6 Get a grip. Since you have only two hands, you'll need a few clamps. Common C clamps, like the silver and red examples shown here, are very useful, but a clasp-type clamp like the one at the bottom is much better. When *Model Railroader's* staffers write their wish lists for Santa Claus, this is what they ask for.

Fig. 7 L-girder construction

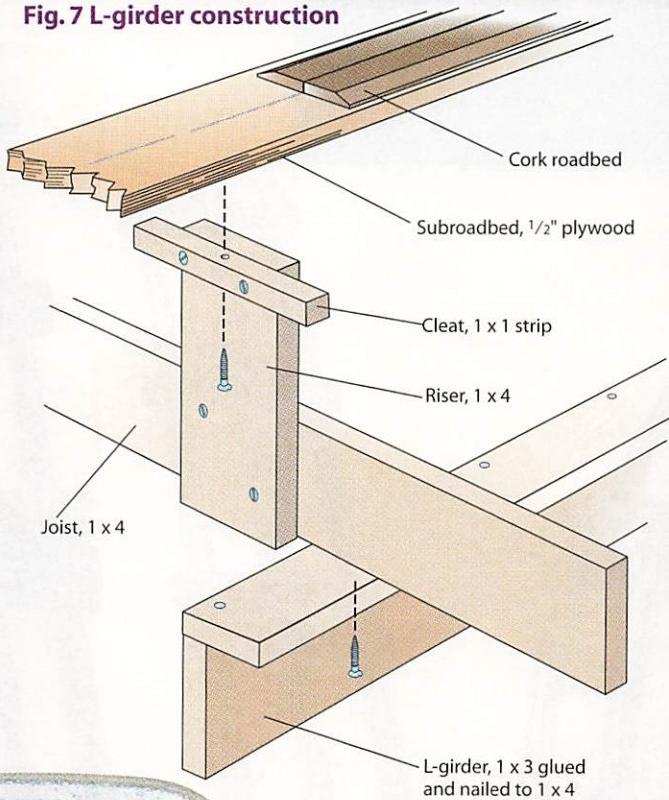
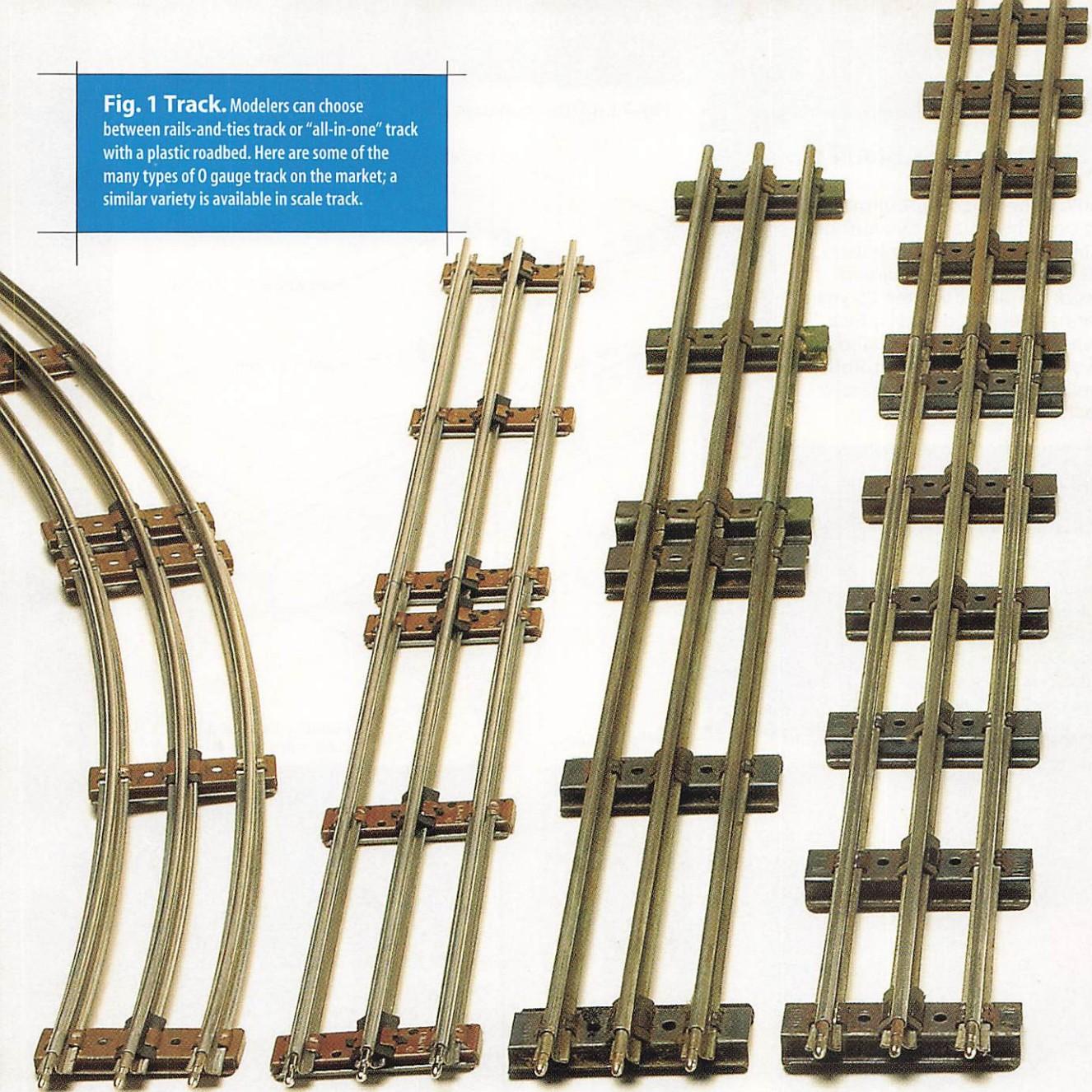
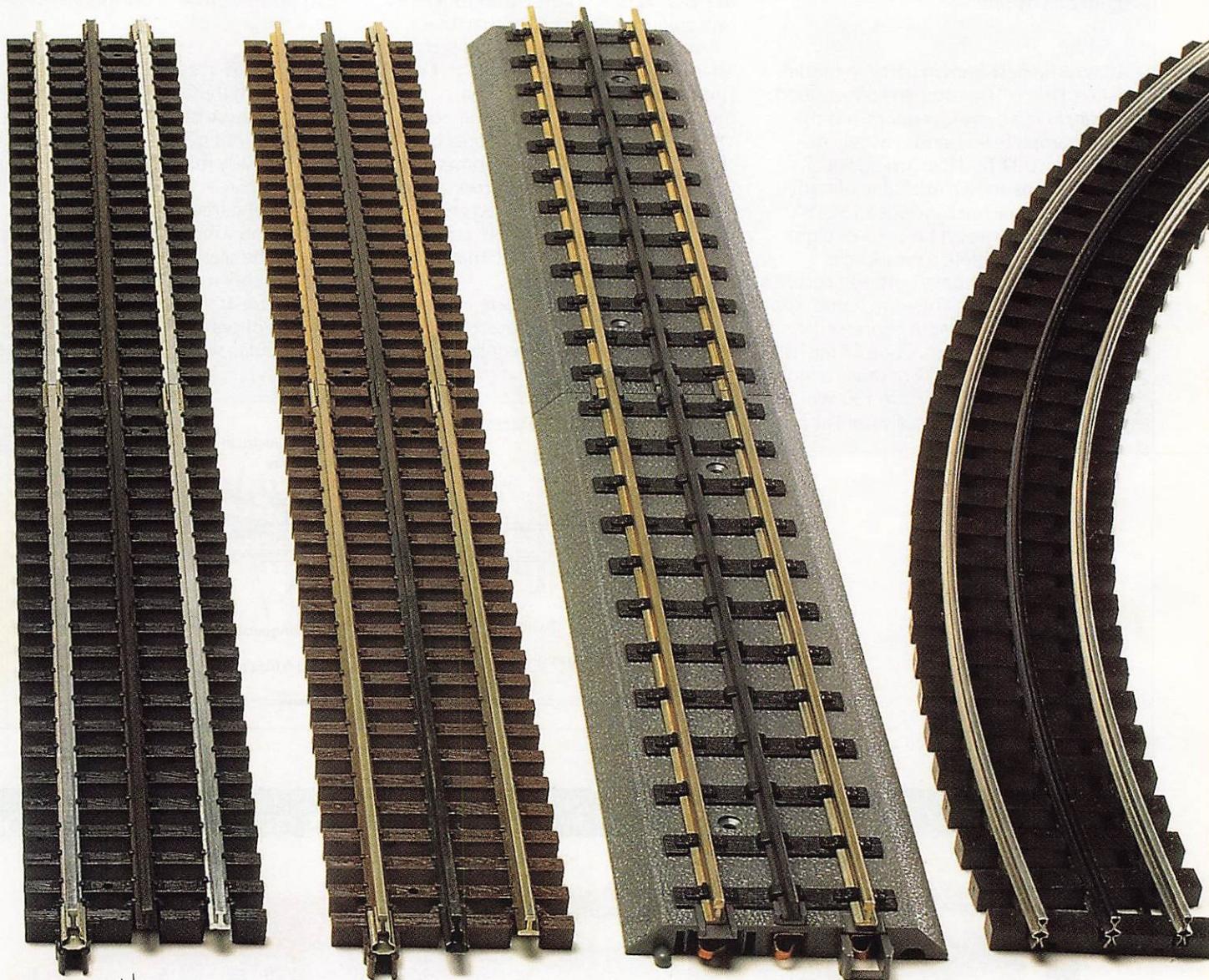


Fig. 1 Track. Modelers can choose between rails-and-ties track or "all-in-one" track with a plastic roadbed. Here are some of the many types of O gauge track on the market; a similar variety is available in scale track.



Tips on track

Expanding your layout and preventing derailments



Many of us get started with that loop of sectional track that comes in a train set. Then the bug begins to bite and we want to add more track. You can expand with the same brand of track that came with your set, but you don't have to. **Figure 1** gives you an idea of the variety of track available – and this photo shows just O gauge products! Visit your local hobby shop or look through a copy of the most recent Wm. K. Walthers, Inc., catalog for your scale.

Two types of sectional track are available, traditional and all-in-one. Traditional track features rails mounted to injection-molded plastic ties. All-in-one track includes plastic roadbed cast to represent the rock ballast that holds the ties on a real railroad. In some brands you can remove the track from the cast ballast base; in others you can't. The big advantage of all-in-one track is that it eliminates track ballasting, a chore that isn't difficult, but does eat up a lot of time.

Manufacturers take various approaches to their track systems, so we'll look at them one by one.

Atlas HO

Atlas is the best-known name in model railroad track. The company offers good quality at relatively low prices, has the most complete line, and is widely distributed. You'll find it in just about all hobby shops. In HO, Atlas' line of traditional sectional track includes 15", 18", 22", and 24" curves. It takes six or eight sections to complete a semi-circle.

You can also choose between code 83 and code 100 track. The term "code" simply means the rail height expressed in thousandths of an inch. Code 83 rail has gained popularity in HO because it looks more realistic than the code 100, which was used almost universally until about

10 years ago and is still common today. The ties on the code 83 are also smaller in cross-section, a little closer together, and colored brown rather than black.

Atlas also offers two lines of turnouts, Snap-Switches and Custom-Line. Over the years we've found that Snap-Switches are almost always the best choice for building small layouts because they take up so little space compared to longer but more-realistic turnouts.

The diverging (curved) leg on a Snap-Switch matches the Atlas 18" curves. Also the straight leg is 9" long to match the standard straight sections.

Custom-Line turnouts are made in nos. 4, 6, and 8 sizes. **Figure 2** shows how these measurements are determined

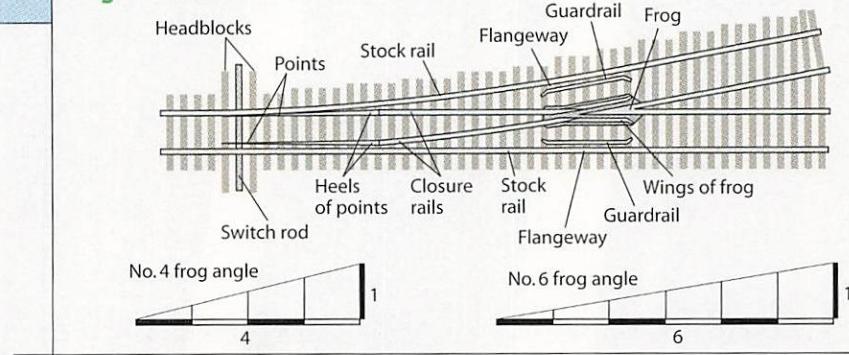
and names the parts of a turnout. For model railroading purposes a no. 4 is a tight turnout, a no. 6 is a medium, and a no. 8 is a gradual.

Atlas HO True-Track

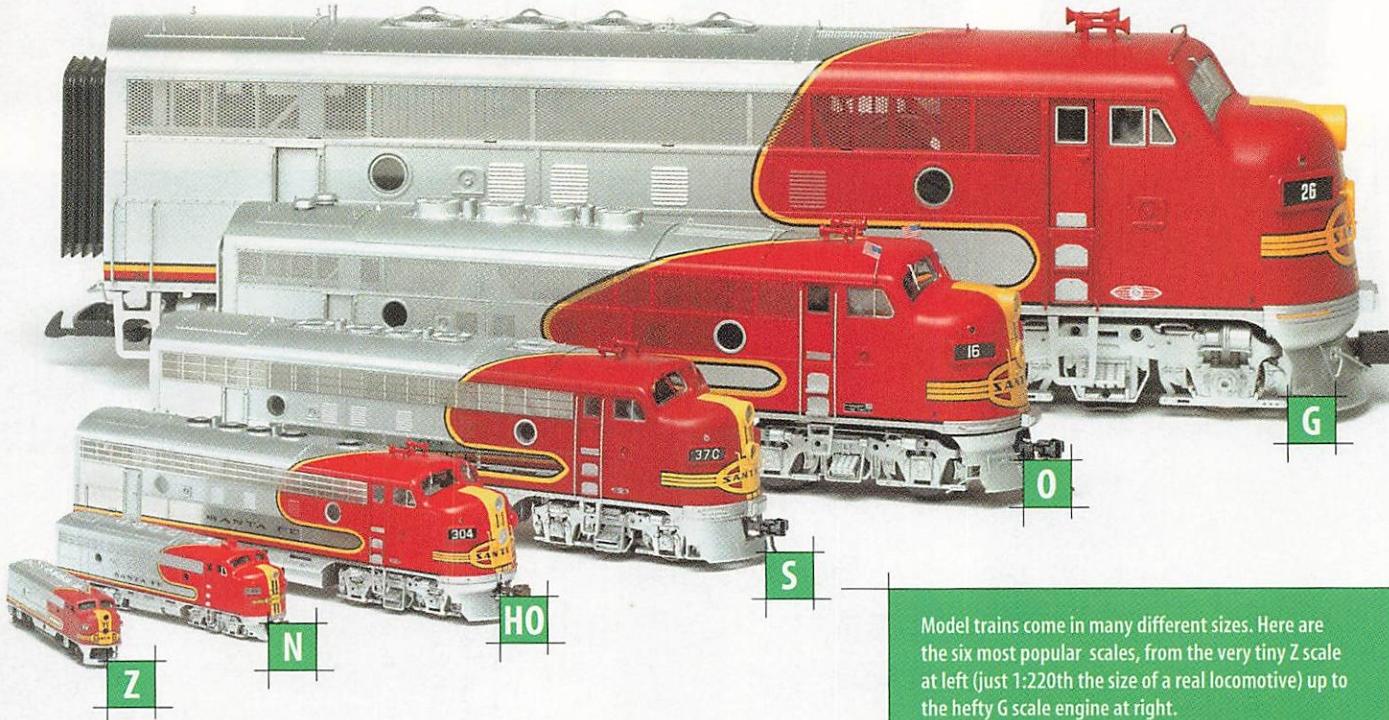
To establish the True-Track line Atlas molded plastic ballast bases to accept some (but not all) of the HO track pieces it was already making. You can pull out the track pieces if you want to paint and weather the track separately. Also, should you someday choose to, you can pull off the plastic ballast, mount the track on cork roadbed, and ballast it by hand. True-Track comes in code 83 only.

Atlas offers excellent track-plan books. In particular, we recommend *Blueprints*

Fig. 2 Turnout Parts



THE SCALES OF MODEL RAILROADING



Model trains come in many different sizes. Here are the six most popular scales, from the very tiny Z scale at left (just 1:220th the size of a real locomotive) up to the hefty G scale engine at right.

for 10 True-Track Layouts and Beginner's Guide to HO Model Railroading, which has plans for 12 small layouts. If you want to design an N, HO, or O railroad using Atlas sectional track and have a PC outfitted with Windows, you can download free software, Right Track Freeware 5.0, from www.atlasrr.com.

Atlas N scale

Atlas' N scale line includes only traditional track. Again there are two rail sizes: codes 80 and 55. Code 55 looks more realistic, but some older locomotives and cars won't run on it properly because of deep wheel flanges.

Atlas has made a strong commitment to the code 55 line and offers a wide range of curves and straight sections. On turnouts you have your choice of no. 5s or no. 6s.

Atlas also makes a code 80 line, which has been around since the 1960s. Atlas' basic N scale turnouts come in two sizes, standard (about a no. 4) and no. 6. The standards have switch machines cast on the side that are like nothing seen on a real railroad. Removing them doesn't help because the ties have no ends on the machine side.

A second line of turnouts, Custom-Line, avoids the appearance problem because they're designed to be used with under-the-table switch machines or ground throws. The Custom-Line turnouts are otherwise identical to the standard and the no. 6 but don't have the missing-tie-end problem.

Bachmann HO

In HO Bachmann offers all-in-one track only. They have two lines: E-Z Track,

which features nickel-silver rail, black ties, and a gray roadbed; and an older line that features steel rail and black roadbed.

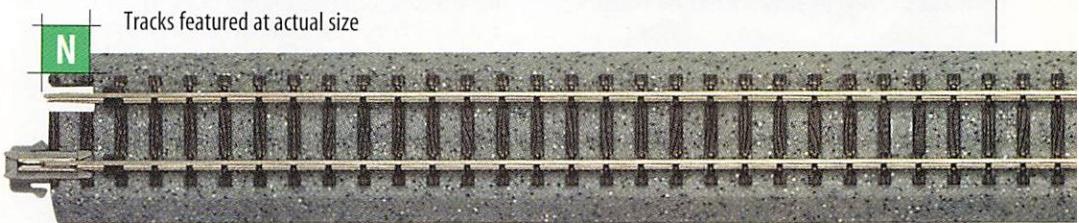
Bachmann is the world's largest manufacturer of train sets, and E-Z Track is designed with the train-set market in mind. The sections have big interlocks at each end that make it easy to put together and also provide electrical continuity. Rail joiners aren't used, a major plus for young modelers, but that also means the track can't easily be mixed with other brands.

The turnouts are designed with space-saving constant 18"-radius curved legs. The company also has no. 5 left- and right-hand turnouts, a no. 5 wye turnout, and a unique track item – parallel tracks with a crossover. A Bachmann manual, the *E-Z Track Planning and Layout Book*, offers information and track plans.

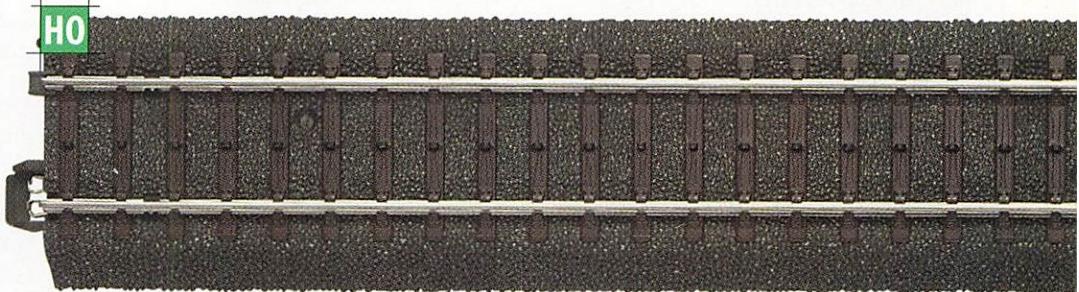
The first choice we make in building a model railroad has to do with size. Since we're dealing with track and trains that are a certain percentage of the real thing, we refer to the "scale" of a model. The Kato N scale track shown at top, is 1:160 proportion (one foot equals 160 N scale feet). The Märklin HO scale track in the middle is 1:87, while the G scale LGB track at the bottom is used to model a range of proportions from 1:22.5 to 1:32. As a general rule, you can get more track in a given space with N scale, but some people find its small size a little difficult to work with. HO scale, about twice the size of N, is the most popular scale and has the widest choice of products. Big, rugged G scale trains are a lot of fun, but take up much more space.

Tracks featured at actual size

N



HO



G

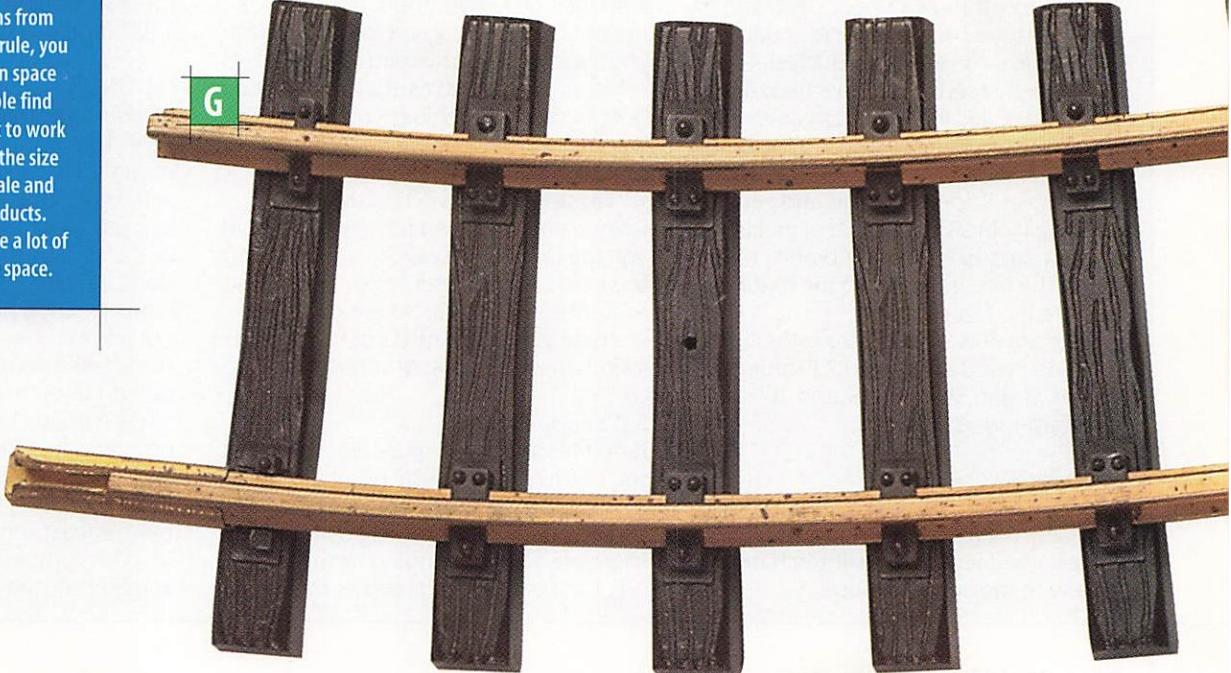
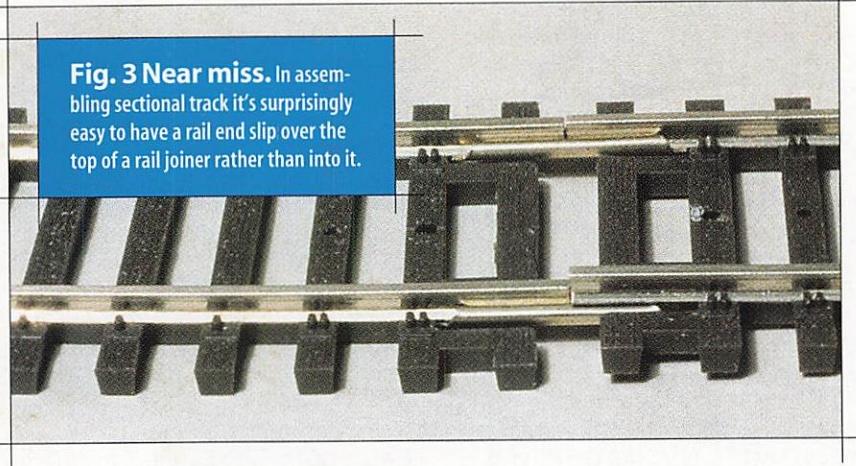


Fig. 3 Near miss. In assembling sectional track it's surprisingly easy to have a rail end slip over the top of a rail joiner rather than into it.



Bachmann track is fairly easy to find and moderately priced. If you're looking to add a little more track to the loop that comes with a Bachmann train set, it makes sense to stay with their track.

Bachmann N

Bachmann also offers E-Z Track for N scale, with 11 $\frac{3}{4}$ "- and 19"-radius curves, 10" and 5" straights, and a 90-degree crossing. (Those 10" straights are nice because you end up with only half as many rail joints on the long, straight parts of your layout.)

There are also left-hand and right-hand turnouts with the curved legs made to match the 11 $\frac{3}{4}$ "-radius curves.

Life-Like HO

Power-Loc is the trade name for Life-Like's code 100 HO all-in-one track. Power-Loc is robust, making it a good choice for younger modelers and for setting up track on a floor. Life-Like says you can pick up an oval and hang it on the wall or store it under a bed. You'll find it with both steel and nickel-silver rails.

Electrical current is conducted through the roadbed connections, and there are no rail joiners, thus eliminating the trickiest part of tracklaying for young fingers. A short adapter track is available with Power-Loc on one end and conventional rail joiners on the other, making it easy to expand with other brands of track. The ties are cast into the roadbed and are the same color.

The HO Power-Loc line is rather limited and includes 18"- and 22"-radius curves, 9" and 3" straights, and 18" constant-radius turnouts.

Life-Like N

Like-Like offers N scale Power-Loc track with 9 $\frac{3}{4}$ " curves and turnouts. These have curved legs that are interchangeable with the curve sections.

Kato

All-in-one track was available for many years from the German manufacturer Märklin, but Kato provided the impetus for the present popularity of all-in-one track with its introduction of Unitrack.

In both HO and N Unitrack is a high quality and reliable product. Unitrack also has the best-looking roadbed, and the turnouts feature built-in and hidden electric switch machines. The rails are connected with rail joiners, but these are much beefier and more reliable than typical sectional track joiners.

Kato HO Unitrack

Current HO Unitrack comes with code 83 nickel-silver rail. (In the past it was code 100.) The system includes curves in radii from 21 $\frac{5}{8}$ " to 31 $\frac{1}{8}$ ". An oval made with the smallest radius will fit on a 4 x 8-foot train table. In each of these sizes it takes eight sections to make a semicircle. Straight sections come 9 $\frac{3}{4}$ ", 6 $\frac{1}{8}$ ", and 4 $\frac{1}{2}$ " long. About all the other HO track lines include rail bumpers, but Kato's is the only one that resembles something you'll see on a real railroad. The turnouts come as nos. 4s and 6s. (Because of the built-in switch machines you don't want water or glue anywhere near these if you scenick your layout.)

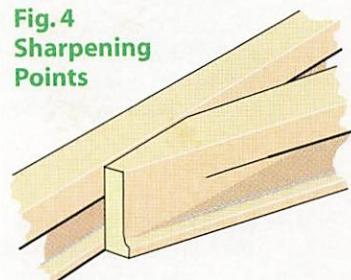
These built-in switch machines are unique with Kato and require a constant voltage DC power source, or you can buy the Kato DC converter to connect to the AC terminals on your power pack. You need only one regardless of how many switch machines you're controlling.

Kato N Unitrack

Kato's N scale line is more extensive than the HO, a reversal of the normal order of things in U.S. model railroading.

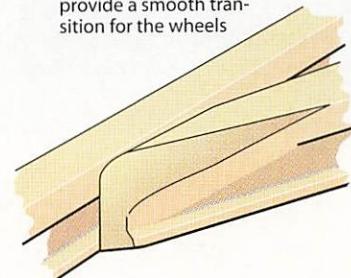
Let's start with the curves, of which there are a bunch ranging from 8 $\frac{1}{8}$ " to 19". Each of these radii comes in various

Fig. 4 Sharpening Points



Before filing

Use a small file to bevel the inside edge of each point rail to provide a smooth transition for the wheels



After filing

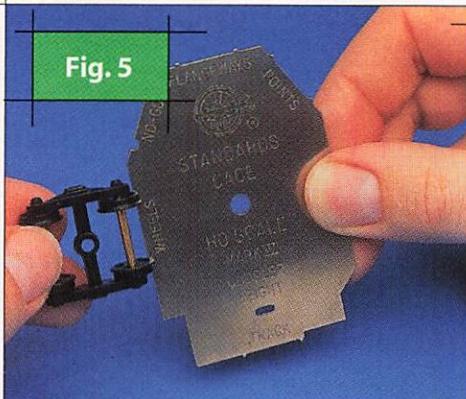
arc segments. Using the larger segments where you can means fewer joints, good for appearance and operational reasons.

There's also a variety of straight sections, including some not found in other lines: an adapter track for connecting to Atlas Snap-Track or other conventional systems, a magnetic uncoupler section for use with Micro-Trains or similar couplers, and an expansion track with telescoping rails.

Turnouts come in nos. 4 and 6; plus there's a double crossover made in one 12 $\frac{3}{4}$ "-long piece.

Märklin HO

Märklin's HO track is actually three-rail track, but the center "rail" is a set of studs mounted in the ties. It's not compatible with other lines of HO track or with HO locomotives made for two-rail DC use, but it has some unique features. You don't have to worry about reversing loops creating problems, because both outside rails have the same polarity. Also, the Märklin system includes smaller-radius curves than most other lines have, so it's a good choice if you're really short on space. In addition to the European and North American items in the Märklin line, most other European manufacturers offer at least some of their trains in Märklin-compatible versions, including some American-prototype items.

Fig. 5

Keep 'em running

Not much can go wrong as long as we're running a train around a simple loop of track, and any problems can almost certainly be traced to rail joints. It's very easy to have a rail end sitting on top of a rail joiner rather than being slipped inside it, as in **fig. 3**.

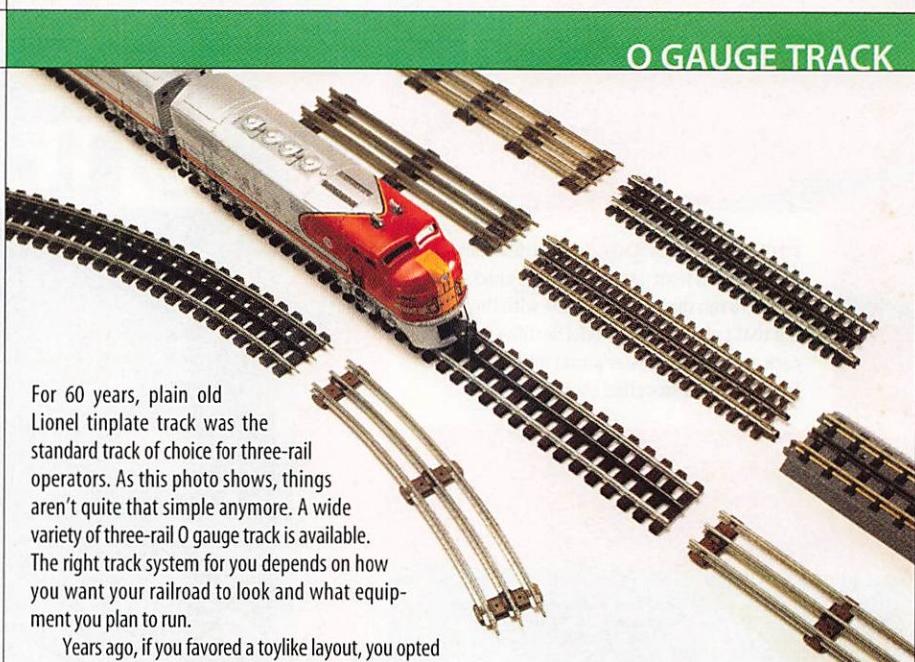
Once you begin to expand a layout, the derailment possibilities increase dramatically. One problem we often see is not using the correct number or sizes of track components: using five curve sections where six are needed, or having the straight sections on one side of the layout not add up to the same length as those on the other. If you have to force the track to make it fit, something is probably wrong.

Checking and tuning turnouts

If the track is laid properly any derailments you have will usually occur at turnouts. If a point is not closing tightly against the stock rail, a wheel flange can slip through and cause a derailment. You may have to carefully bend the point. Also, if the point is blunt the flange can bounce over it rather than follow the route you've selected. Fix this problem by sharpening the point, as shown in **fig. 4**, with a needle file.

Derailments aren't always caused by the track. If one car or locomotive keeps derailing, look at the trucks to see if they're pivoting freely, and check the wheels to make sure they're spaced the correct distance apart. The National Model Railroad Association sells gauges you can use to check your railroad's vital statistics. Most hobby shops have them. See **fig. 5**.

One of model railroading's pleasures is learning to tune track. It's fun to solve those little mysteries and even more fun to watch your trains run smoothly and trouble-free.



For 60 years, plain old Lionel tinplate track was the standard track of choice for three-rail operators. As this photo shows, things aren't quite that simple anymore. A wide variety of three-rail O gauge track is available. The right track system for you depends on how you want your railroad to look and what equipment you plan to run.

Years ago, if you favored a toylike layout, you opted for traditional Lionel tubular track with its distinctive tall tubular rails and stamped-steel ties. If you were inclined toward realism, then you bought GarGraves track, with its more-realistic rail profile and closely spaced wood (or plastic) ties. Both of these track systems are still available, joined by a number of newer types, including all-in-one track with molded plastic ballast.

Today there are two basic types of O gauge track on the market: traditional tubular and newer solid rail. Hollow tubular track is made from a ribbon of thin metal bent to the shape of a rail. Solid-rail track is just that – solid. A bar of metal is drawn to create a rail with a T-shaped cross section, just like real rail.

Scale and gauge

Newcomers to the hobby are often confused by the terms "gauge" and "scale" with regard to track. Gauge is the distance between the inside of the outer rails of the track, while "scale" refers to the proportional size of the train and related models.

Most of the confusion is between track dubbed "O gauge" and track that is labeled "O-27." Both are the same gauge (1 1/4" between the rails), and many, though not all, O gauge trains can run on either type of track.

O-27 track looks like a junior version of traditional tubular O track. Its rails are smaller in height, its ties are flatter, and it is less expensive than regular O gauge tubular track. Any locomotive by any manufacturer will run on either O or O-27 straight track. The problem is with the curves. Even some equipment that can negotiate a 27"-diameter curve can't go through an O-27 switch because the frame of the locomotive or car scrapes the raised box housing the switch mechanism.

Although it got its name from its original, and very tight, 27"-curve diameter, O-27 track is now available in a number of diameters – just like regular O track.

Working with tubular track

Traditional tubular track with metal ties is used on both O gauge railroads featured in *Model Trains Step-by-Step*. Tubular track is offered by several firms, including K-Line, Lionel, and Williams. The GarGraves Trackage Corp.

also makes tubular track, but only in large-radius curves that are not useful for smaller layouts.

Assembling tubular track is simple. Take one section, align the pins with the next section, and insert! Be advised that on newly made track, this can be a tough prospect since the pin holes can be tight. Because you're dealing with potentially sharp metal edges, work gloves are highly recommended.

With traditional tubular track, an outer rail can be insulated by installing small pieces of cardboard or other insulating material between the outer rail and the metal ties. (GarGraves track, with its plastic or wood ties, is already insulated.) This is handy because it allows you to electrically isolate track sections so passing trains can automatically trigger accessories such as signals and crossing gates.

Tubular track comes in a wide variety of curves, and accessory activator sections and many types of other special track sections are offered as well.

Cutting tubular track

You may need to create a unique section for a custom fit. This is simplicity itself. Put the section you need to trim in a vise, or hold it between short pieces of wood with the remainder hanging off the front porch step (or workbench), and cut it off with a hacksaw.

If you use a motor tool instead of a hacksaw, be sure to wear eye protection. Finally, use a file to smooth the metal burrs from the cut edges.

Solid-rail track

Solid rail track looks more like real track in miniature. The rails are mounted differently depending on the brand. Atlas O rails are mounted on two types of plastic ties (simulated wood or simulated concrete), and MTH and Lionel go a step beyond by mounting their rails on plastic ties molded into a plastic roadbed.

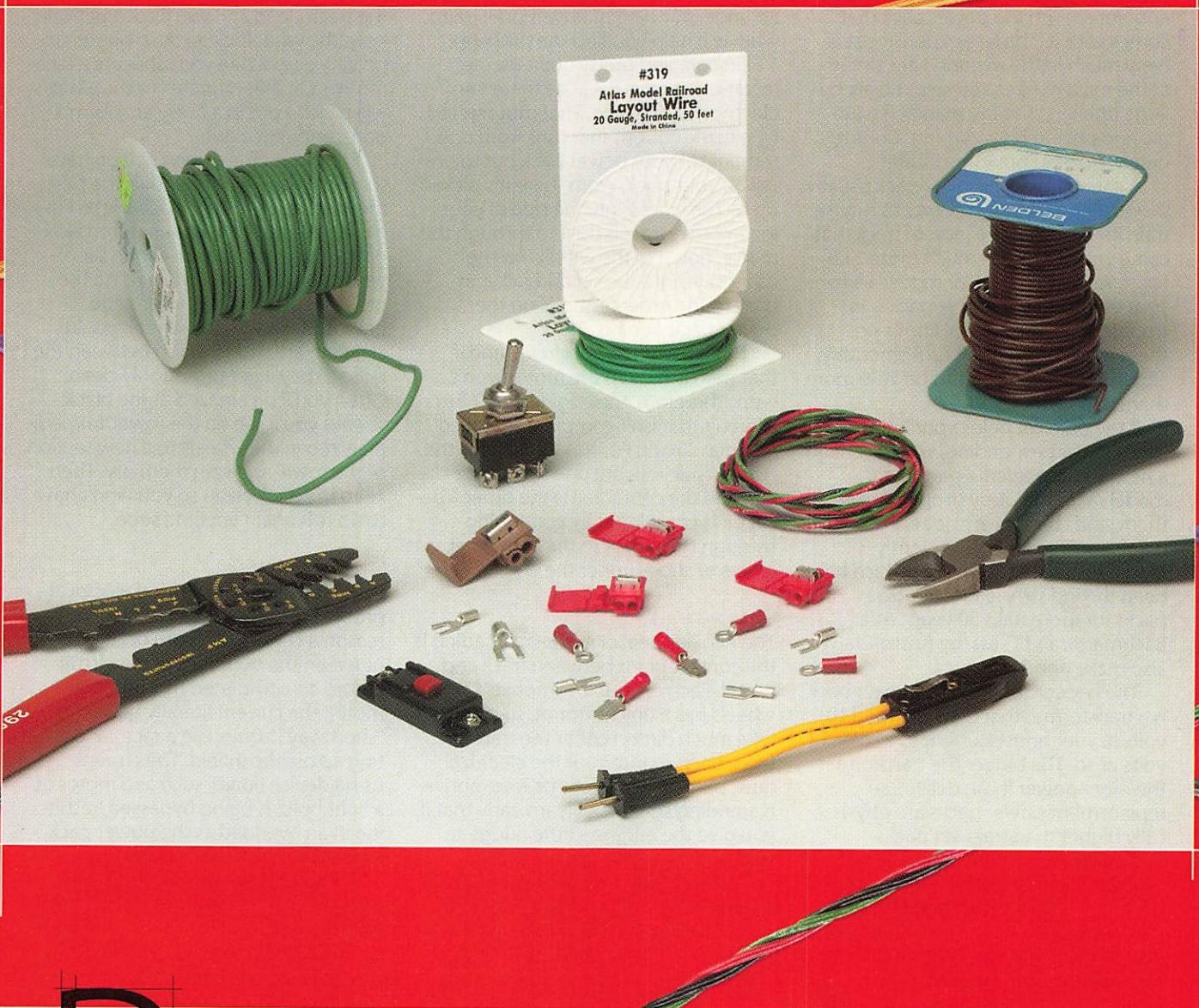
Atlas O offers a video introduction to the track system, a layout book, and track-planning software. It also offers pre-selected track packages to build specific layouts in its track plan book. #

Fig. 1 Power packs. The blue power pack below is from a train set. It has enough power to run the train that came with the set, but that's about it. The Model Rectifier Corp. pack at right has greater power output, more features, and a smoother control knob.



Wired right

It all begins and ends at the terminals on your power pack



Powering the loop of track that comes with a train set couldn't be simpler. You connect the two wires provided to the proper terminals on the power pack and you're done. Just make sure you've connected those wires to the right terminals. For most power packs made for two-rail trains, it will be marked "Variable DC," or perhaps "Track." The pack's AC (alternating current) terminals are for powering accessories such as switch machines or lighting in

buildings, and they're usually labeled either "AC" or "Accessories." If you connect your track wires to those you'll probably do permanent damage to your locomotive's DC electric motor.

O gauge trains using three-rail track, such as those made by Lionel, MTH, and K-Line, run on AC current. You still have only two wires to hook up because the center rail is one side of the circuit and the outer rails are the other side.

Train-set DC power packs

If you get started with an off-the-shelf HO or N scale train set, you may be disappointed with the power pack that comes with it. The less-expensive sets (very much in the majority) are aimed at the mass market and sold mostly by large retailers. The toy market is a jungle and pricing is everything. Unfortunately, quality sometimes suffers.

A cheap train-set power pack usually produces just enough power to run the train in the set on the loop of track that came with it and not much more. See **fig. 1**. Add more track or more cars to your train, and the power pack is in trouble. Also, the control knobs on these packs often don't turn smoothly, and the control range can be little more than on and off.

If the train set holds your interest and you start expanding, you may need a new, more-powerful pack. Your model railroad hobby shop will have them, and chances are good the brand name you'll see most frequently is Model Rectifier Corp. (MRC), which has been the industry leader in power packs for more than 50 years. Atlas, Bachmann, and Crest (by Aristo-Craft) also make good packs.

The key component in a power pack is a transformer that converts the 110-volts in your house current to a safer 18 volts or so. The bigger the transformer the more power it can deliver, so replacement power packs are physically bigger than train-set packs.

You won't have the power pack problem, or at least won't have it so soon, if you start with a higher-end train set such as those from Walthers, Atlas, Athearn, Micro-Trains, and Kato. (Often you'll need to go to a hobby shop to find these.) These sets include a better power pack or no power pack at all, so you can choose from those your dealer carries.

How your train runs

Connect the wires, turn the throttle, and your train should run. If it doesn't, an understanding of how model trains work will help you find the problem.

First off, and pretty obvious, the locomotive goes because there's an electric motor inside. That motor is fed by electric current that runs from one terminal of your power pack out to one rail on your track. From there it's picked up by the wheels on one side of your locomotive, travels up and through the motor, down to the wheels on the other side, into the second rail, and back to the other terminal on the power pack. See **fig. 2**.

This is the electrical circuit, and if that path is broken the motor won't work; therefore, the engine won't run. A circuit that isn't completed is called an open circuit. For three-rail trains the two outside rails are one side of the circuit and the center rail is the other. The circuit is completed by continuing through the motor to the center rail, via rollers or shoes under the engine.

Cleaning track

The Achilles heel of model railroading is the contact point between track and wheel. Each of your locomotive's wheels has a tiny footprint, so it doesn't take much dirt on either the track or the wheels to interrupt the electrical flow, particularly when the locomotive is standing still. We all learn early that if you give the engine a little nudge to get started, it'll often keep going.

Hobby dealers frequently hear from customers who are puzzled because the train ran great for several days, then began to stutter and stumble, and finally won't go at all. Almost every time the solution is to clean the track. Liquid cleaners are available, but for small layouts the most effective track cleaner is a mildly abrasive rubber block.

Bright Boy is the most commonly found brand, but there are others.

A light swipe or two with a Bright Boy doesn't get the job done. You need to scrub the track like you mean it. Any time you've been working on the railroad, cutting wood in the room, or building scenery, you need to clean the track thoroughly before beginning to run trains – vacuuming is also a good idea after any construction project. Otherwise you'll find yourself cleaning locomotive wheels, and that's a tougher job.

Cleaning wheels

Locomotive wheels can get dirty only if they pick up dirt from the track, so keep the track clean and you'll automatically keep the wheels clean. Also be sure to go very easy when you lubricate a locomotive. Oil that migrates to the wheels will pick up dirt in a hurry and form a non-conductive gum.

For those times when you do have to clean wheels, **fig. 3** shows the best method we've found. Place a little liquid cleaner (we prefer denatured alcohol) on a paper towel, run one set of wheels on the towel while using the other set on bare rails to provide power. Make sure the wheels you're cleaning are sitting down between the rails so they'll get thoroughly clean. Often you'll be amazed at the black streaks you'll see on the towel. Immediately move the wheels to a new section of the towel and spin them dry. Then keep the track clean so you won't have to do this again anytime soon.

Short circuits

Let's look at another critical electrical problem – the short circuit. If for any reason a conductive path occurs between the two sides of our circuit before it's completed through the motor, the current literally takes the "short way" home, like a race car cutting across the infield. The current-using device (load), such as a motor or a light bulb, is being bypassed, resulting in an overload as the power pack pours forth all its power. See **fig. 4**.

Fortunately power packs usually have circuit breakers that shut off the power quickly and prevent or minimize damage. Often the circuit breakers in power packs reset automatically once the short circuit is corrected, so when a train won't go, look for something metal lying across the track. (Also make sure the power pack is plugged in!)

Another place to check for shorts is the power pack terminals. Make certain no bare wires from one terminal touch the second terminal or bare wire leading from it. With solid wire you'll generally have no problem making neat connections, but with stranded wire you need to be careful. One tiny strand bridging the gap can cause a short.

With either type of wire, loop your connection behind the terminal screw clockwise, in the same direction the screw tightens. Using crimped spade lugs on your terminal wires makes for a neater installation.



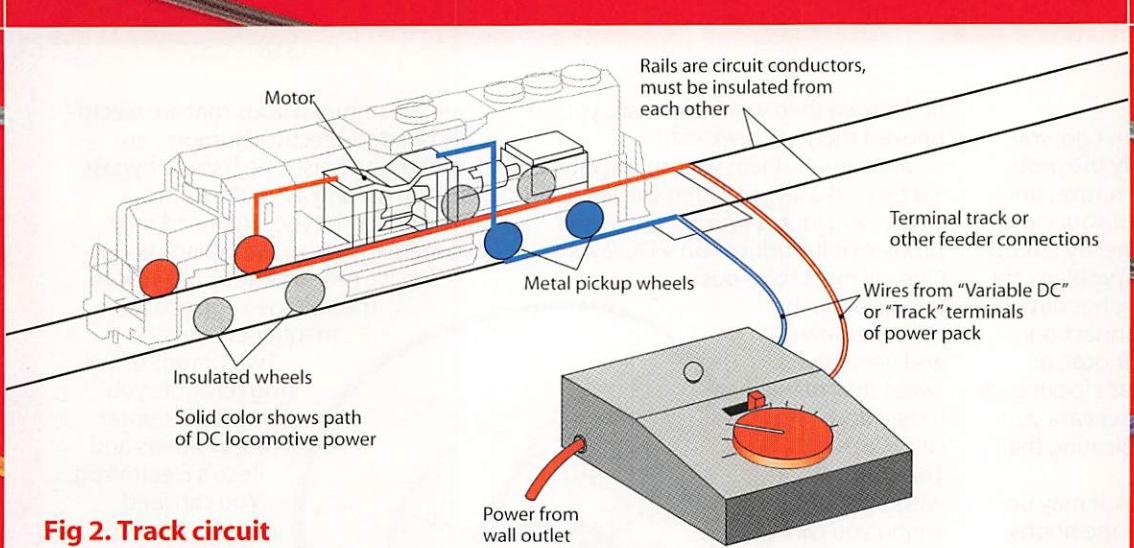
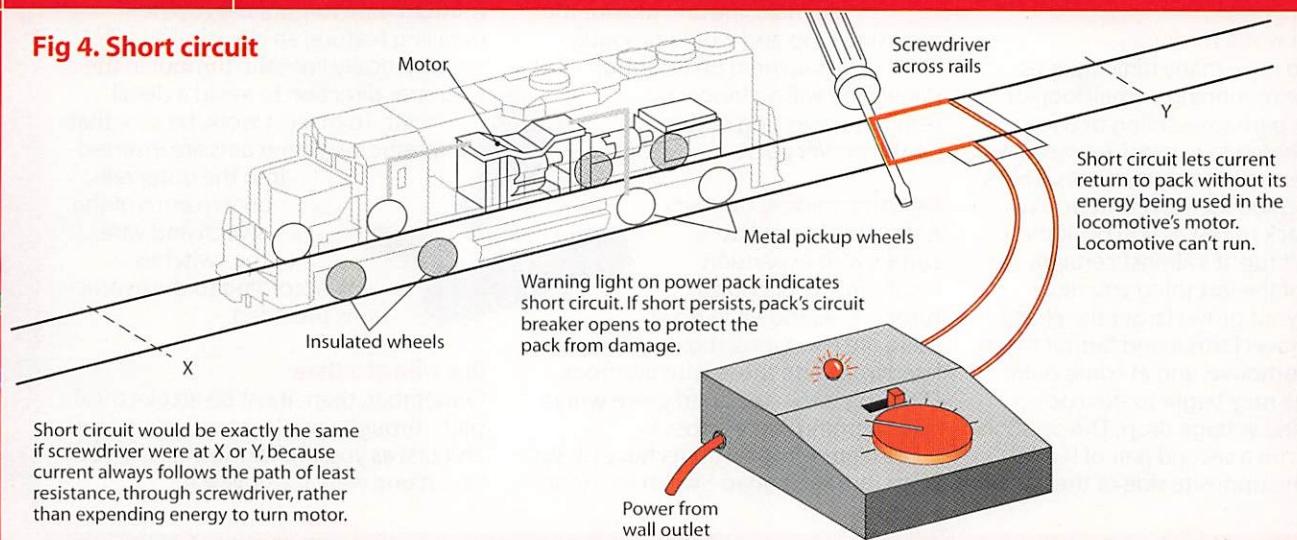


Fig 2. Track circuit



Fig 4. Short circuit



Short circuit would be exactly the same if screwdriver were at X or Y, because current always follows the path of least resistance, through screwdriver, rather than expending energy to turn motor.

Troubleshooting

To find out why a train won't go, you need to isolate and identify the problem. Let's start at the locomotive, since it's located at the far end of your circuit. If you have a second engine, try it out. If it runs, you've found your problem, the misbehaving engine either has dirty wheels, a bad electrical connection somewhere inside, a bad motor, or some mechanical bind that's locking up the mechanism. In this latter case you should hear a buzzing, indicating that the motor is trying to run.

If the motor doesn't run, it may be time to take the engine to the hobby shop for repairs. Often the dealer knows what problems a particular type of engine is prone to. If it wasn't a good engine to begin with (most inexpensive train-set engines aren't), then pitch it and buy something better.

If the motor is okay, figure out how the wheels transfer power. Sometimes a metal wiper that rubs against the wheel can become dirty.

Now let's look at the track. A good investment is a simple test light that you can buy at the hobby shop or at RadioShack or another electronics outlet. Touch one lead to one rail, one to the other, and the light should come on, assuming the throttle is open.

Next use the test light to check the pack's terminals.

Finally, and it's a long shot, plug a light or a radio into the wall outlet to make sure household current is getting to the outlet. It probably is, and if the power pack still isn't working, you're probably in the market for a new one.

Troubles beyond the loop

It's hard to have many difficulties as long as we're running a small loop of track with perhaps a siding or two. Once we begin to expand, however, we sometimes encounter mysteries. That's why it's a good idea any time you're adding track to test as you go. If the train won't run, it's almost certainly because of the last thing you did.

As a layout grows larger the electricity must travel farther and farther to get to the locomotive, and at some point the engine may begin to slow down. This is called voltage drop. The solution is simple: run a second pair of feeder wires to the opposite side of the layout.

(If the train then won't run at all, you've hooked them up backwards.)

Another problem we can run into as we expand a layout is that we've added a reversing loop. **Figure 5** shows the problem it introduces on a DC layout. One rail must have positive polarity, the other negative, and never the twain shall meet. If they do, a short circuit results. This means that without special wiring you can never have a track plan where a train can come back down a track heading in the opposite direction from which it came. Otherwise both rails are trying to be both positive and negative at the same time, which is an electrical impossibility.

Incidentally, reversing loops are not a problem for three-rail trains.

It's surprisingly easy to introduce a reversing loop into a track plan without realizing it, particularly if we've added a lot of complicated track. **Figure 5** shows two common occurrences.

Figure 6 shows you how to solve the reversing loop problem using a few extra wires.

You need to electrically isolate a section of track so that while the train is running on it you can reverse the polarity on the main line.

You now have two reversing switches, one for the main line and one for the reversing loop and would probably want to install them on a control panel. You will no longer be using the reversing switch on the power pack.

Selective-routing turnouts

A third problem that comes with expansion results from our choice of turnouts. As shown in **fig. 7**, there are two types, those with insulated frogs and those with live frogs. (The frog is the X-shaped piece where the diverging routes cross.)

Insulated-frog turnouts have plastic frogs (the Atlas Snap-Switch is a good

example) or metal frogs that are electrically isolated. Electrical jumpers are built into the plastic tie base to bypass the frog. As long as you're using turnouts of this type, you need only two feeder wires to the layout, assuming it's not so large as to run into the voltage-drop problem mentioned earlier.

Two brands of live-frog turnouts you might encounter are Walthers and Peco's Electrofrog. You can feed track power to these only from the point end. If you have feeder wires attached to the rails diverging from the frog you'll get a short circuit. You'll need to isolate the frogs with insulating rail joiners to eliminate the problem, then you need to add feeder wires to the rails beyond the frog to "jump" current beyond the turnout.

With extra wiring involved, why would anyone want to use selectively routed turnouts? The answer lies in better electrical continuity. A metal frog conducts electricity but a plastic frog doesn't, so anytime a locomotive wheel is on a plastic frog it can't receive current. Slow-moving, small steam engines, 0-4-0s for example, and small four-wheel diesels can have a difficult time running over plastic frogs without stalling. Also, almost any engine can balk running over plastic frogs when wheels and track aren't clean.

Most powered three-rail turnouts use track current to move the switch points between straight and curved routes. These turnouts have a non-derailing feature; an electrical circuit automatically lines the turnout in the proper direction to avoid a derailment. To make it work, be sure that plastic insulating pins are inserted into the outer rails on two ends of the switch and wire the switches according to the instructions provided.

One wire at a time

Remember, there must be an electrical path through your locomotive's motor, and test as you go. Wiring is easy if you take it one wire at a time. #

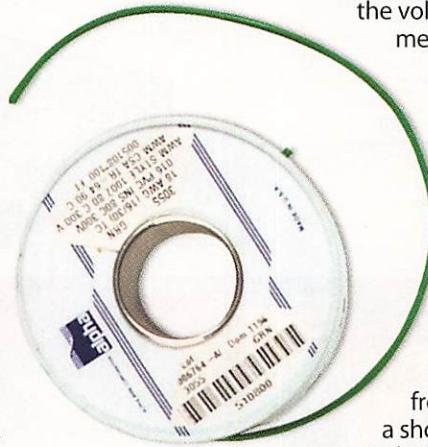


Fig 5. Reversing loop short circuits

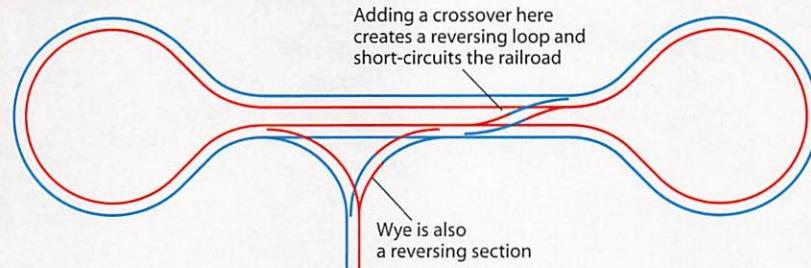


Fig. 6 Wiring a reverse loop

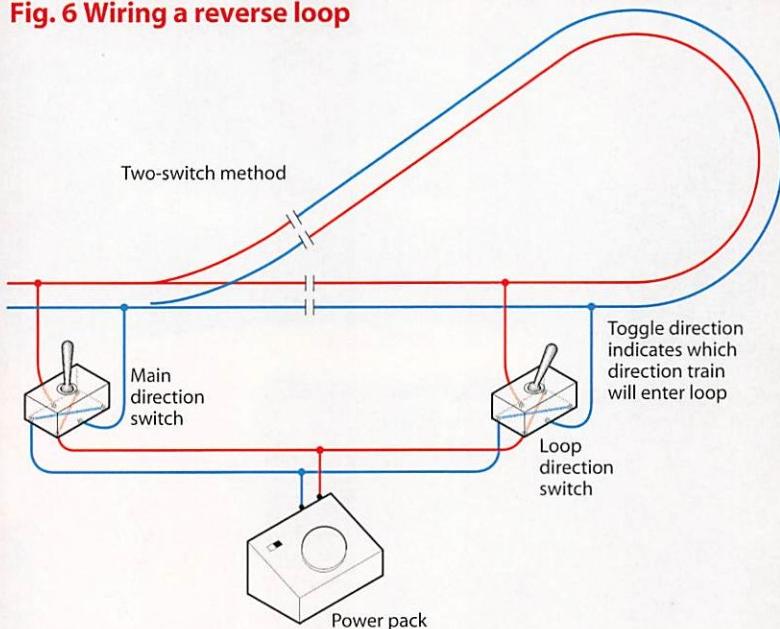
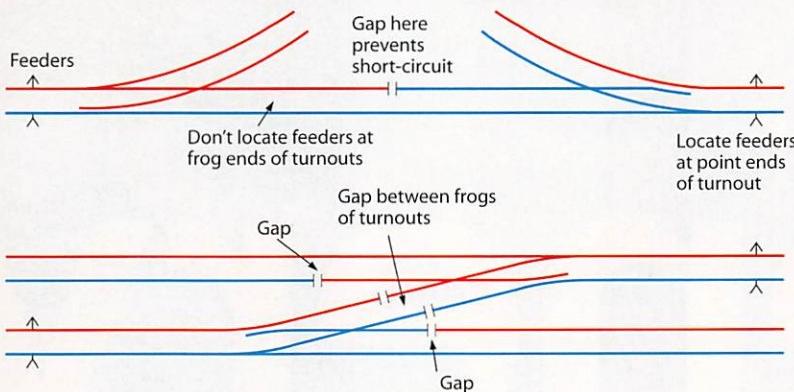


Fig. 7 Wiring live-frog turnouts

You can use live-frog turnouts for spurs, but you must feed power to them as shown.



RUN MORE THAN ONE

You can operate two or more engines on a one-power-pack railroad, but not at the same time. The others must be parked on dead sections of track while one locomotive runs. Running multiple trains simultaneously calls for special wiring so you can use more than one throttle. Basically, you need to divide the layout into multiple electrical blocks and use a system of electrical switches to transfer control of the blocks from one throttle to another.

A book on wiring, such as Andy Sperandeo's *Easy Model Railroad Wiring* (Kalmbach Publishing Co.) will take you through that.

If you're modeling in HO or N scale and dream of multiple trains moving on your layout, we recommend that you choose a DCC (Digital Command Control) system over multiple block wiring. Information about DCC can be found in many model railroading books, but Lionel Strang's *DCC Made Easy* (Kalmbach Publishing Co.) is a good one to start with. He explains the subject in language you don't have to be an electrical engineer to follow.

Model railroading is more than trains. Building a sturdy train table, choosing the right track for your needs, and wiring for flawless operation are important first steps, but it's scenery that brings your railroad to life. Great scenery, like this autumn landscape on James EuDaly's O scale layout, is within reach of anyone.

James EuDaly

Super scenery

Taking a big leap to a realistic railroad



ots of model railroaders have a hard time getting started on scenery. New modelers often see this phase of layout building as artistic, and so they shy away from it, thinking they don't have that kind of talent. On the other hand, assuming they've done a good job to this point, they have an attractive, good-running layout they enjoy and don't want to risk messing it up by attempting something new, even if they know it could make their layout even better.

The problem here is unfamiliar waters, and the solution is to jump in and get familiar. There's no rule saying you have to practice your first scenery on the layout itself. Tack some roadbed and track on a 2 x 4 sheet of plywood, a ceiling tile panel, or whatever else you might have, and see what you can do. We think you'll be pleasantly surprised. (The same principle of experimentation can be applied to other worrisome model railroad challenges, soldering rail

joints for example, or attaching electrical feeder wires. Such a test board would be particularly good for learning to ballast track.)

Experience is the best teacher, no doubt about it, but the experience doesn't always have to be your own. Lots of expert help is available. Kalmbach Publishing Co. has several excellent books on modeling scenery. Woodland Scenics, the leading manufacturer of scenery products, also has a good manual to help get you going.

Probably you have a track plan, whether one you drew yourself or one you found published in a book or magazine, which suggests where the mountains, rivers, tunnels and so forth are to go. If not, you've probably been thinking about it and have a pretty good idea, so let's get started.

Gonna' make a mountain

There are lots of ways to build scenic forms, and once the ground cover is added, visitors won't know what's underneath unless you tell them or they crawl under the layout and take a peek. Here we'll look at the two most-popular methods: extruded foam insulation board and cardboard strips.

For smaller layouts foamboard is the most popular choice today. Extruded foam insulation, often pink but also sometimes blue, gray, or green, depending on the manufacturer, is the sheet material you'll see glued to basement walls when you drive past houses under construction.

Foam insulation board is available at building supply stores. It comes in 4 x 8-foot sheets but is scored so you can easily snap it to 16" or 24" widths if you have a problem getting it into your car. If you work in construction, know someone who does, or don't mind doing a little dumpster diving, you can often find enough discarded foam at a new home site to supply several layouts. It's better to recycle it into a model railroad than see it trucked to a landfill.

You can cut the foam board easily with a handsaw or a saber saw, but the less foam dust you generate the better. It becomes electrostatically charged and sticks to everything, your clothing and hair in particular. Go slow if you use a variable-speed saw and you'll get less of this nuisance. Here's a good tip

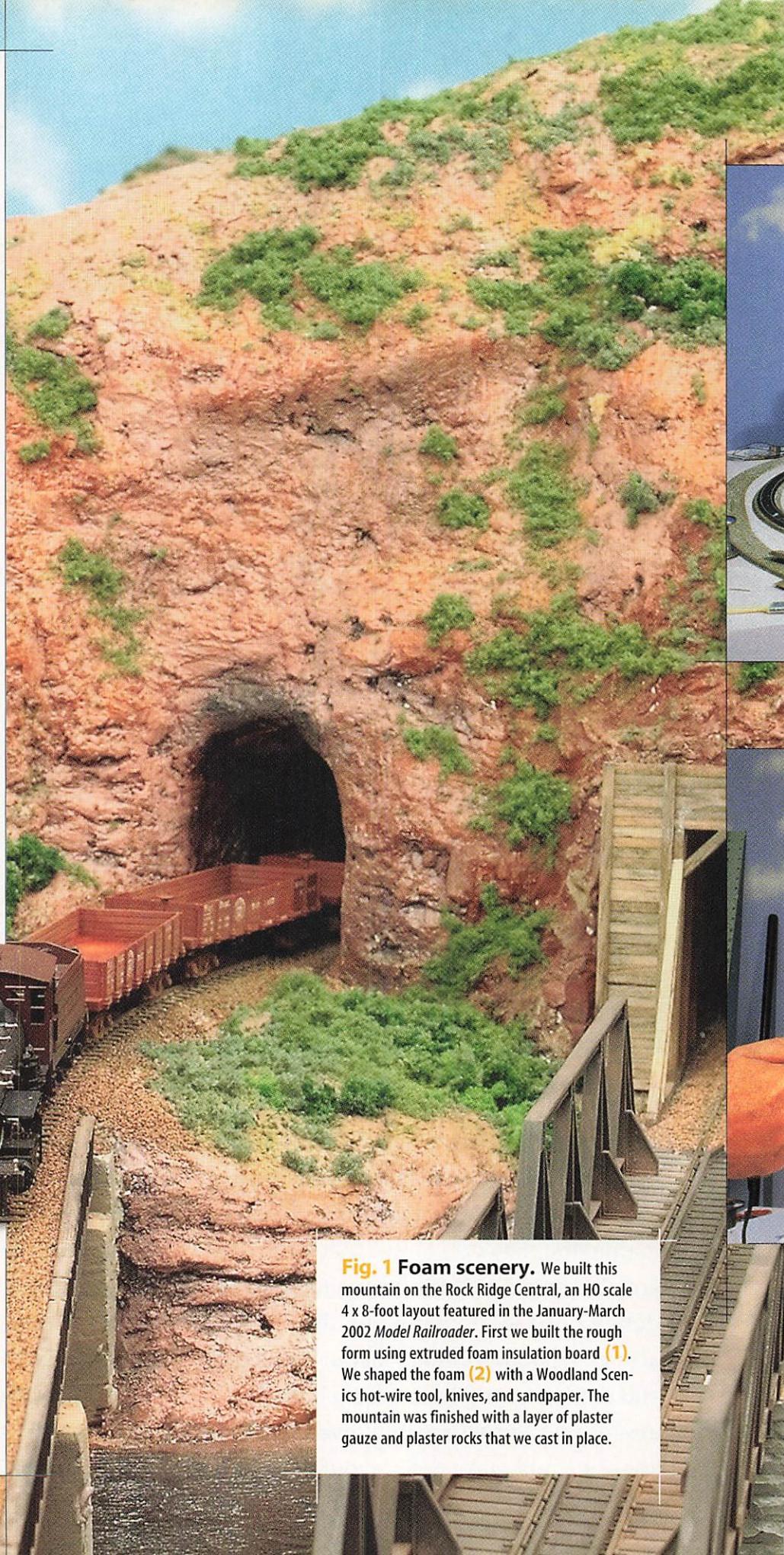
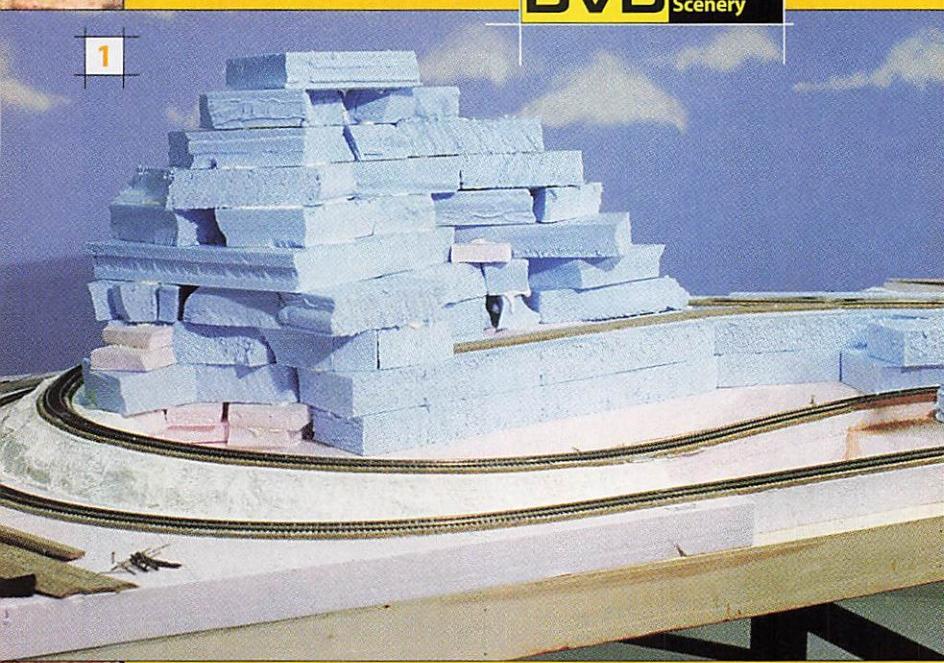
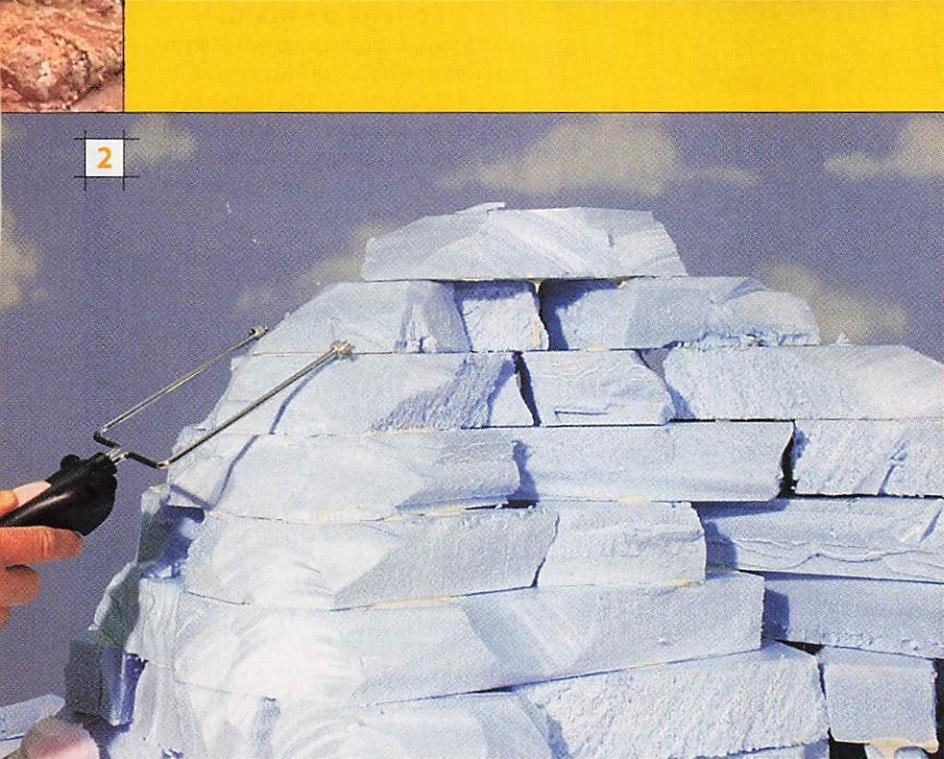


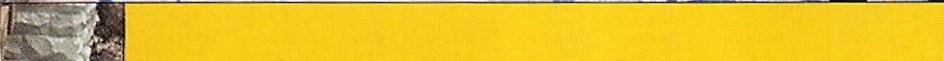
Fig. 1 Foam scenery. We built this mountain on the Rock Ridge Central, an HO scale 4 x 8-foot layout featured in the January-March 2002 Model Railroader. First we built the rough form using extruded foam insulation board (1). We shaped the foam (2) with a Woodland Scenics hot-wire tool, knives, and sandpaper. The mountain was finished with a layer of plaster gauze and plaster rocks that we cast in place.



1



2



we picked up from scenery expert Ingrid Drozdak: Spray yourself lightly with an anti-static laundry spray before you start cutting, and those crumbs won't be so eager to jump on you.

As shown in **fig. 1** we build up the foam scenery by gluing layers on top of one another.

Neatness in all things model railroading is a good habit to form, but foam scenery doesn't always have to be built up in smooth-flowing layers. The neater you build it though, the less carving you'll have to do. On a big mountain, like the one shown in **fig. 1**, we took to breaking big pieces of foam over our knee and piling them up.

Once you've cut your foam, or at least enough of it to know where you're going, you can begin gluing the pieces together. The best adhesive we've found is tube construction adhesive which you can apply with a caulking gun. Make sure you buy an acrylic adhesive that's safe for use on foam, as many adhesives will attack it.

Carving foam

You can shape foam with all sorts of tools. Serrated cake knives work well, but don't use your the one in your kitchen. You'll never cut cake with it again. Go to the supermarket and buy something inexpensive. Knives work best when you shave off foam about a quarter-inch at a time. Small handsaws also work well.

To carve foam really neatly the best tool is a hot-wire cutter. This is an electrically heated wire that melts its way through the material while you guide it with an insulated handle. Woodland Scenics makes a nifty handheld hot-wire tool.

Hot-wire tools do a great job and give you a lot of control, but they work rather slowly. If you try to rush the job you'll stretch the wire and perhaps even break it. (Replacement wires are available.) Also, if you try to go too fast the foam surfaces will fuse together behind the wire, and your cut will "heal" itself. Be aware that cutting foam (except for beadboard) with a hot wire releases noxious fumes. You must work in a well-ventilated area.

As you work with foam you'll discover various knives and tools that work well for you. Coarse sandpaper will get into places you can't reach otherwise. Foam-rubber sanding blocks work great, as do the sheets of sandpaper with foam backing.

Once you're close to where you want to be, a good all-around tool for

finishing the job is a Stanley Surform plane. These come in various sizes and configurations and feature a perforated working surface with hundreds of cutting edges. These are especially good for smoothing a surface that will be receiving foliage.

Foam scenery is easy to revise. If you've cut off too much, just cement on some more and start carving, or you can stick on some chunks and cover them with plaster gauze, about which we'll have more to say.

In an area where you'll have lots of foliage or ground cover, you can just paint the foam with tan latex paint and start adding it, as shown in **fig. 2**. If you'd like a smoother surface you can apply a layer of plaster gauze.

You can also build foam scenery from beadboard, and lots of model railroaders do. Beadboard is the white insulation material you'll see at building supply and hardware stores. It's often sold in shrink-wrapped packages of several 2 x 4-foot sheets. It's more difficult to carve than extruded foam because it's made by pressing plastic foam beads together under heat, and the beads tend to tear out when cut.

Cardboard-strip scenery

An older method of scenery making, but one that still has its advantages, is cardboard-strip weaving, as shown in **fig. 3**. This method is especially economical for larger layouts. A 4 x 8-foot sheet of 2" rigid foam isn't exactly cheap, so the expense for large layouts with tall mountains can "mount up."

For small scenery features any kind of cardboard, cereal boxes or whatever, will do just fine. Strips cut from corrugated boxes generally work best for larger features. In general, the longer the strips you have on hand the easier the job.

Your first task is to cut the cardboard into strips. About 1" to 1½" strips work well, yielding about the right strength but enough flexibility to make contouring easy. It's a good idea to cut the material with a steel straightedge and a utility knife. "Break the backs" of the strips by holding them at each end and drawing them across your knee while pulling down.

You're now ready to build a hill. To make the job go quickly, try using two types of staplers: first, a heavy-duty type that can staple the strips to wood, and second, a clasp-type for stapling the strips together. Actually, for small layouts or tight budgets you can get by without either and use glue instead.

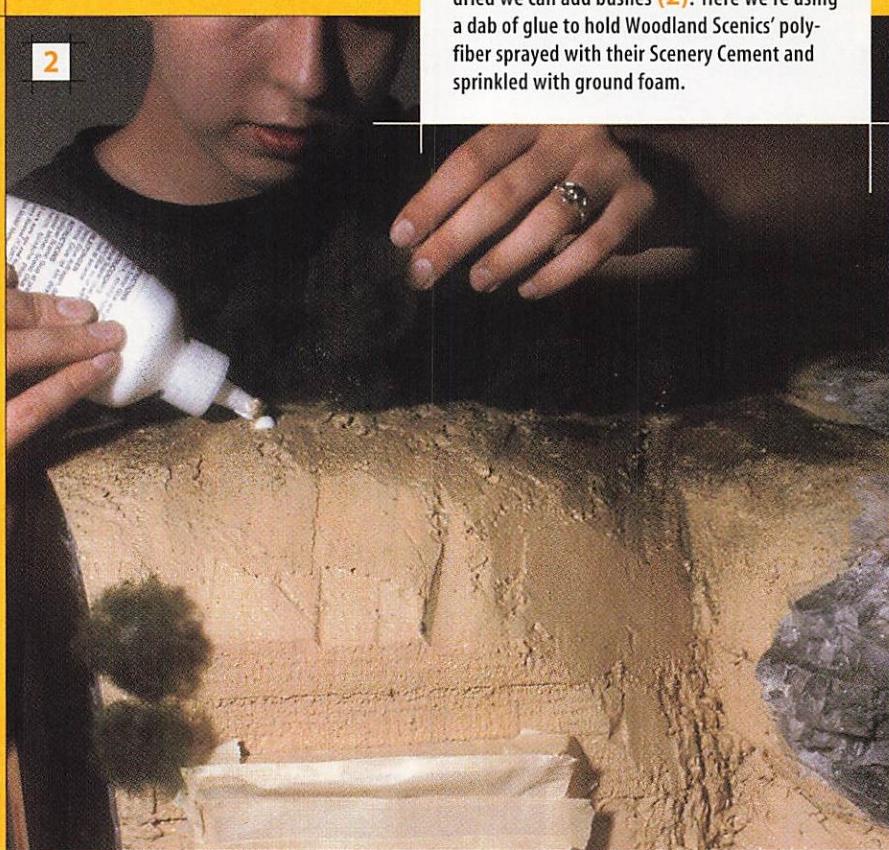
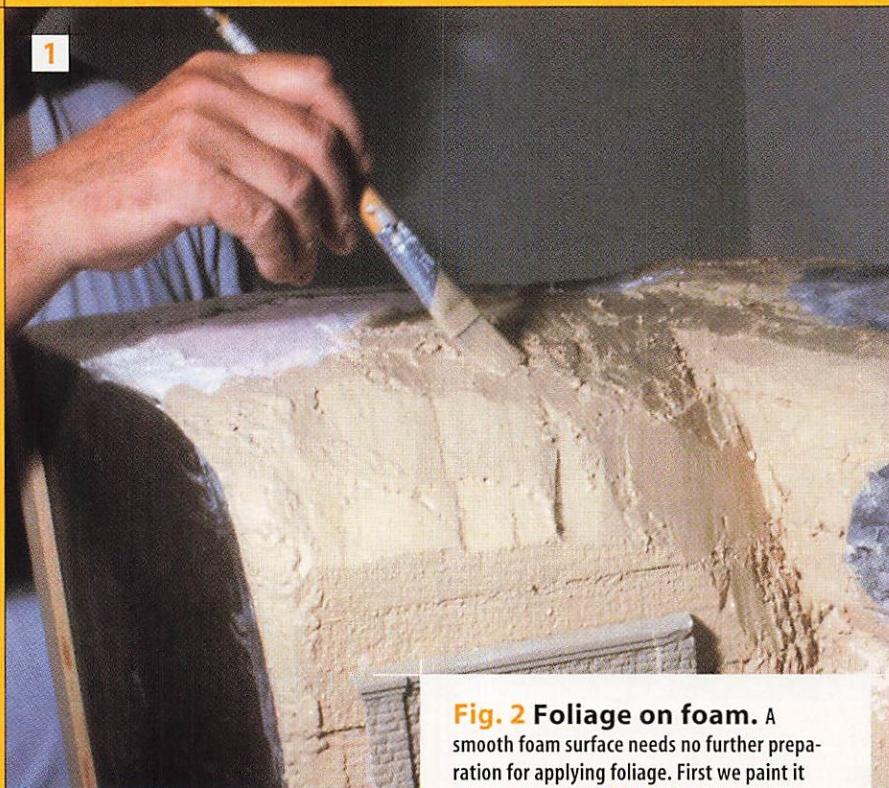


Fig. 2 Foliage on foam. A smooth foam surface needs no further preparation for applying foliage. First we paint it with tan latex paint (1). After the paint has dried we can add bushes (2). Here we're using a dab of glue to hold Woodland Scenics' poly-fiber sprayed with their Scenery Cement and sprinkled with ground foam.

Fig. 3 The cardboard-strip method. Here's how we built the desert-side hill on the Alkali Central, presented on page 74. First we placed a row of vertical strips (1). Then we wove horizontal strips across to make a lattice and used a stapler to join the strips where they crossed (2). Then we draped the hill with Rigid Wrap, a plaster-impregnated gauze. A double layer gives all the strength you need (3- next page). Once the gauze was hard we smoothed off the hill with Sculptamold, applying it with a putty knife (4). We used a throwaway 1" brush dipped in water to smooth the surface (5). Your fingers also make an effective smoothing tool, but only if you dip them in water first.



The job will take a little longer, but you can speed it up by using a hot-glue gun. If you do so, wear work gloves because sooner or later you're going to get hot glue on your fingers. The glue doesn't get hot enough to cause much damage, but it sure hurts.

Start building by erecting several feet of vertical strips, place the strips about 3" apart. Keep in mind that the shell you're making will be about $\frac{3}{8}$ " thick when you're done, so keep the strips $\frac{1}{4}$ " or more below the profile board or roadbed edges you'll be fastening them to. We use yellow glue for these connections and usually try to glue the strips to the underside of roadbed rather than on the edges – you can continue a strip right on beyond the roadbed to the next connection point. Real railroads usually have ditches alongside their roadbeds to keep their track high and dry. You need to allow room for those features.

Scenery shells tend to break away from layout edges made of Masonite, and certainly you can't drive staples into it, so bend the cardboard and glue several inches of it against the board. In critical areas glue on 1" or so lengths of 1 x 2 wood and glue or staple to those. The back of a hill, where it'll be butting against a wall or a backdrop, doesn't need much support. You can just let it "float."

Once you've established several feet of vertical strips, you can begin adding the horizontals. Weaving them over one vertical and under the next makes for a stronger structure. Staple the strips together where they cross and you'll be surprised at the strength.

It's easy to modify the web of strips if you don't like how your hill is turning out. To shorten them just cut out sections and restaple. To lengthen them just cut them and splice in more strip.

Covering the strips

Now you can begin covering the strips. In the past we often used paper towels dipped in a soupy mix of plaster. We'd use Hydrocal plaster when we could find it because it's so strong, but patching or molding plaster also worked. The result we call "hardshell."

Plaster-dipped towels are still perfectly good for making a hard shell, but it's a messy operation and you're stopping fairly often to mix up a new batch. Today's alternative is a little more expensive but much easier and neater to work with: plaster gauze that comes in rolls. This is a material adapted from the field of medicine where it's used to

make plaster casts to protect broken bones. To use it for model railroad scenery we dip it in water then simply lay it on the cardboard web where it'll set up in about 10 minutes. Two brands available in hobby shops are Woodland Scenics and Activa's Rigid Wrap, which is a bit thicker. If you use Woodland Scenics, dip it in the water quickly so it doesn't get "mooshy," or even better, lay it where you want it and spray it with water.

If you're doing a large hill, don't try to cover it all at once. If the cardboard gets too wet, it can collapse. Work your way up a little bit, and then let the plaster set before continuing.

A double layer of gauze is all you need. You want the joints to fall atop strips. Rub the joints lightly with your finger to get a good bond.

Covering the shell

At this point you have a solid scenery shell, but it looks malnourished – its ribs are showing. Also it's not as strong as you want the final structure to be.

To cure these ills we'll add a top coat. You can use plaster, again with the attendant mess, but I recommend an Amaco product called Sculptamold. Your hobby shop may carry it, but it's also available at art supply stores. Basically, it's papier-mâché – ground-up paper mixed with plaster. It's easy to mix and hangs together so well that you'll have little mess. If you try Sculptamold you'll fall in love with it. If you're going to use a lot, you'll save money by buying a 25-pound bag, although your hobby dealer or art supply store will probably have to order it for you.

Mix the Sculptamold to a fairly firm consistency and apply it to the hardshell with a putty knife. It'll eventually dry hard as a rock and extremely strong, so there's no need to put it on any thicker than you need to to disguise the web.

A glass bowl works best for mixing any kind of plaster product because the plaster won't stick to it, making clean-up much easier.

Once the Sculptamold begins to set, which takes only a few minutes (although you can continue to work it for quite awhile), you can get rid of any marks left by the putty knife by dipping your fingers in water and using them to rub the surface smooth with light, circular motions.

Once you have a hardshell surface, it's still easy to modify. Just tap lightly with the side of a hammer to break the area you want to change.

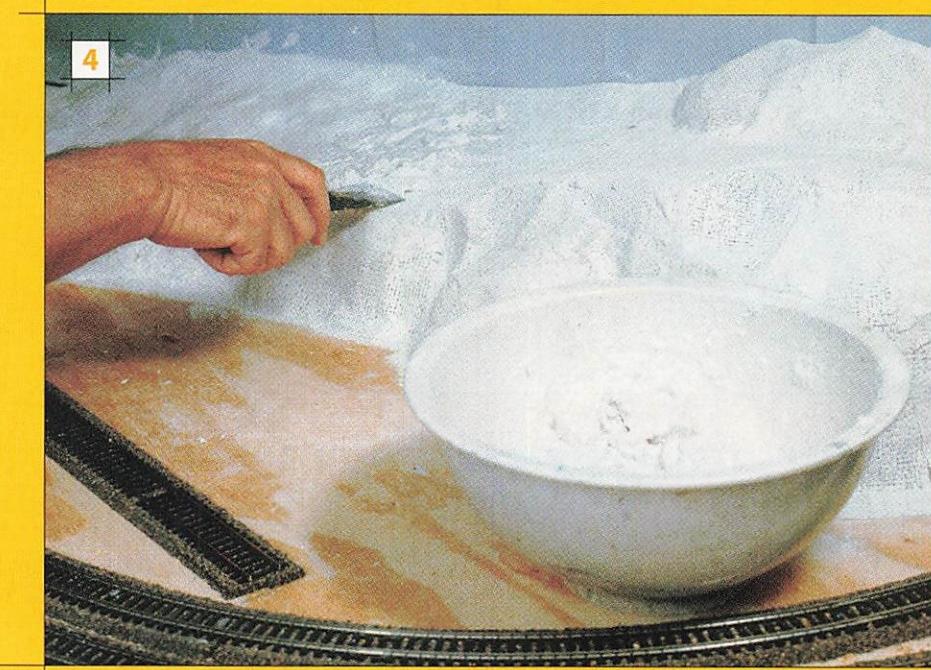
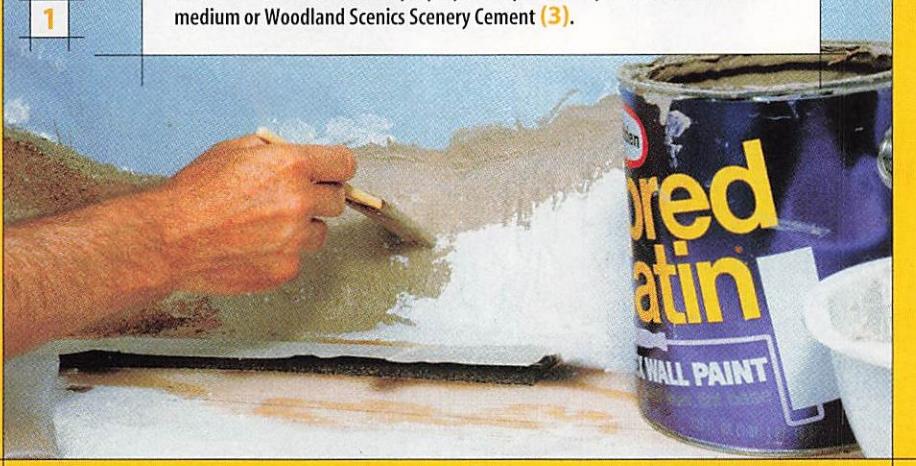


Fig. 4 Adding ground cover. The first step in modeling the ground is painting it with thinned tan latex paint (1). Next sprinkle on texturing materials such as dirt, sand, and ground foam. Representing a barren desert or lush green meadow is simply a matter of the materials used (2). As the texture materials build up, spray them periodically with diluted matte medium or Woodland Scenics Scenery Cement (3).



Modeling the ground

Now we're ready for that most magical moment in model railroading, bringing our scenery to life with grass and foliage. See **fig. 4**.

Our first step is to paint the ground with flat tan latex paint, using a brush. We thin the paint about 50:50 with water. Lots of beginners will buy a dark brown, but tan works better. Remember, our model railroad is indoors under lighting that comes nowhere near rivaling the sun's intensity.

The paint's adhesive nature comes free, so start sprinkling on the ground cover materials while the paint's wet. An added benefit of this is that some of the paint will be absorbed into the first materials to hit and tint them with the ground color for a very natural look.

Woodland Scenics is the brand of green foam you'll see most often, but there are others. This is literally foam rubber that has been ground up and then dyed various shades of green and other colors. All the tiny ragged surfaces give the foam a "living" look you just can't get with other materials.

For the most-natural results, leave some bare or near-bare areas here and there, and use several shades and textures of green. Apply the foam slowly rather than just dumping on a heavy uniform layer. Vary your shades of green between light, medium, and dark.

Woodland Scenics has a mix of green colors it calls Turf which works very well, but you still want to use some others. Woodland Scenics also sells shaker bottles for applying the foam, or you can make your own by punching holes in a jar lid. The holes need to be fairly large, $\frac{1}{4}$ " or so, or the foam will hang up in the bottle.

Build up the ground cover in layers, now and then misting on a thinned adhesive from a household spray bottle. You can use acrylic matte medium (available at art supply stores) or ordinary white glue, such as Elmer's. Thin either about 6:1 with water, and add several drops of liquid dishwashing detergent to help it penetrate. When the glue dries, the ground cover will look quite natural yet will be firmly bonded in place. If you don't like mixing things, Woodland Scenics makes a ready-to-use scenery cement that comes already formulated for spraying.

The most common scenery problem we see is the "golf course" look, caused by not using enough foam and putting it on too evenly. Obviously, the fix is simple – just add more and more varieties of foam.

Besides variation in color you also want variation in texture, which you can achieve by adding clumps of coarse foam. You can add other materials too, such as dirt, sand, or small rocks. Let the paint dry before applying sand or gravel, or else your brush marks will show through. Also go easier with the spray adhesive because these materials, unlike foam, won't be absorbing any of it.

Modeling rocks

Most modelers make their rocks out of plaster. Some use real rocks, but using them successfully is not as easy as you might think. They tend to look like real rocks placed on a model railroad, which is to say they don't look real.

Unless you take the time to learn hand-carving, you'll get the best rocks by casting them in commercially available rubber molds.

You can cast your rocks at the workbench, or you can mold them in place on the layout. Lots of model railroaders like to use Hydrocal plaster because it takes and holds details well.

Figure 5 shows the steps involved in casting a rock. First wet the mold with "wet" water (water with a little dishwashing detergent added) from a spray bottle. This will help the plaster pick up fine detail.

Have the molds ready before mixing the plaster because it's unpredictable. Setting time can vary from a minute to as much as 15 minutes, depending on temperature, humidity, age of the product, and, it sometimes seems, whims of the plaster gods.

After the castings have set up firm, you can take them out of the molds and make another batch. Let the rocks set for a day or so.

Before attaching the rocks to a hillside, spray water on the area where they'll go. Spray the backs of the castings as well. Then set them in place with a creamy mix of plaster. (Wetting the surfaces prevents them from sucking water out of your wet plaster before it has a chance to set properly.) Use a putty knife, hobby knife, or old paintbrush to blend the castings together while the setting plaster is still soft enough to work.

Casting rocks in place goes the same way, except that you keep an eye on the molds as the plaster is setting. Pick up a mold and flex it slightly. If the surface of the plaster crinkles, you're ready to take it to the layout.

Wet the area where you're placing a rock, then hold the mold in place until



Fig. 5 Making plaster rocks.

Before pouring plaster in a mold we mist it with water (1). Rocks can be cemented to the layout after the castings have dried, or you can cast rocks in place, as shown here (2).

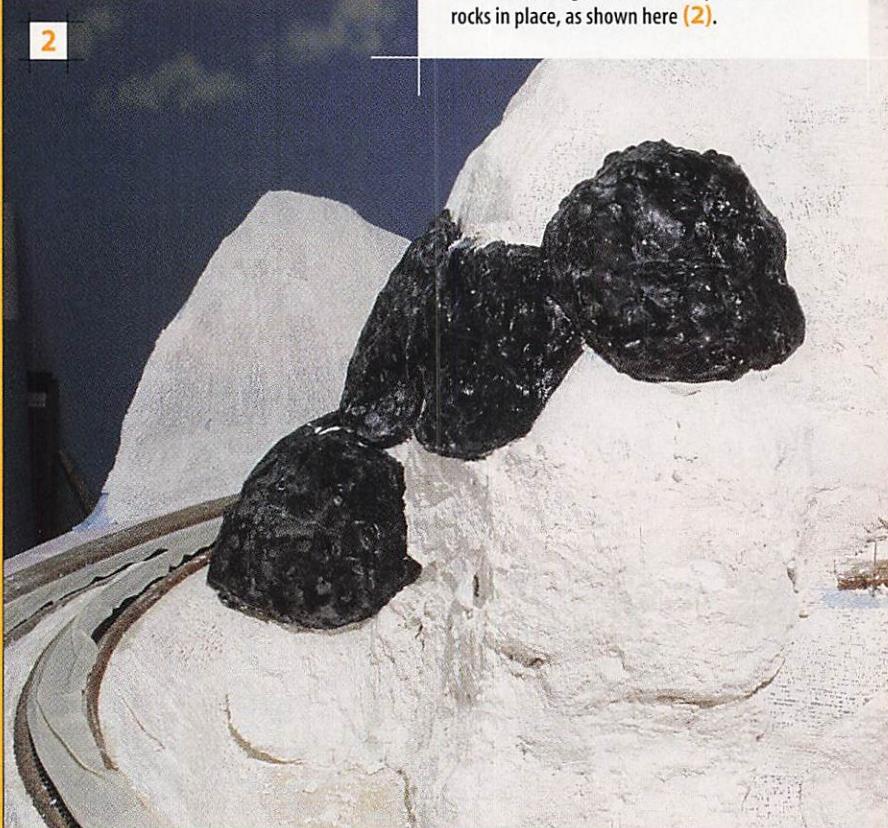
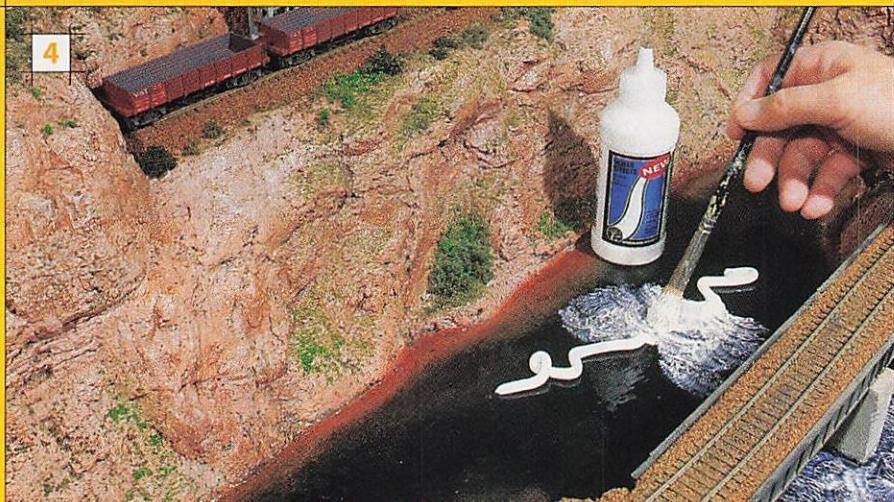
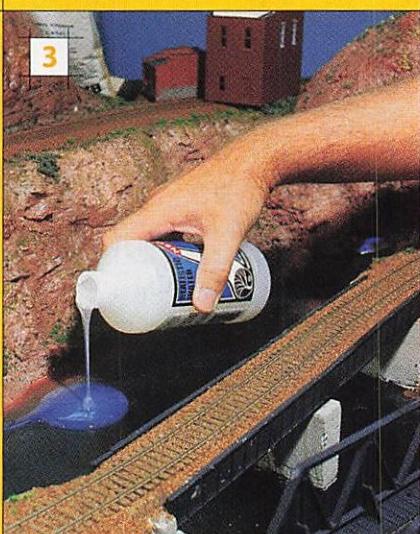
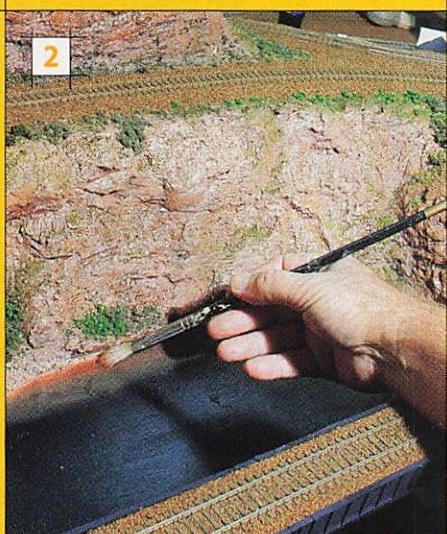
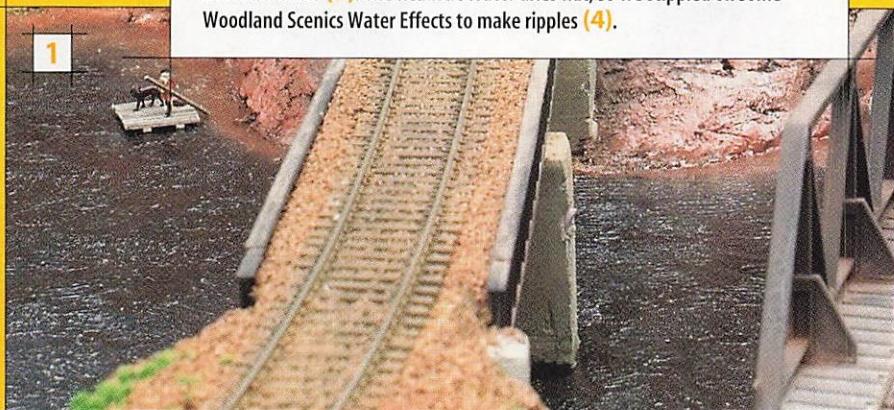


Fig. 6 Modeling water. To model water on our Rock Ridge Central (1) we first painted the surface black, then we added lighter colors near the shore to create the illusion of depth (2). We poured on Woodland Scenics Realistic Water (3). The Realistic Water dries flat, so we stippled on some Woodland Scenics Water Effects to make ripples (4).



the plaster sets, which usually takes about five minutes. When the plaster "kicks," you can feel the mold warming under your hand. You can let go now, but wait a few minutes before carefully peeling the mold off the casting.

Overlap the castings slightly and apply a little plaster between them. Use the tools mentioned a little earlier to blend the surfaces together.

Coloring rocks

We usually paint rocks, especially those made with Hydrocal, which doesn't take stain well. Recently though we tried a rock-coloring kit by Mountains in Minutes and got excellent results.

To paint rocks, brush on a coat of thinned white latex paint and let it dry. Then brush on artist acrylics, using earth tones such as raw umber, burnt umber, raw sienna, and burnt sienna, and lightening them with white. Once the colors are on the rocks, you can spray them with water so they flow into the nooks and crannies. Some judicious use of red and yellow here and there will perk up your rocks.

Once the paint has dried, you can brush or spray on a wash (thin mixture) of black that will flow into the cracks and help bring out detail.

Wait until the rocks have dried completely, then highlight them by dry-brushing with white and other light colors. A flat $\frac{1}{2}$ " brush works very well. Dip the tip in paint and wipe off most of it on a paper towel. Then stroke lightly down on the rocks, leaving just a little paint on the surfaces. This makes the rocks look as if they're being struck by sunlight. Go easy, as a little drybrushing can go a long way.

Modeling water and trees

There are many ways to add water, but **fig. 6** shows one that's easy and effective. You wouldn't think painting a water surface black would result in a realistic look, but it does. It's the shiny surface that creates the illusion. We used Woodland Scenics Realistic Water here, but you can also use acrylic gloss medium or acrylic gloss varnish.

Modeling trees is a vast and varied model railroad subject. Your hobby dealer can show you several ready-made trees and tree kits, and you'll find lots a wealth of information on trees in Kalmbach's scenery books.

Time to build a layout

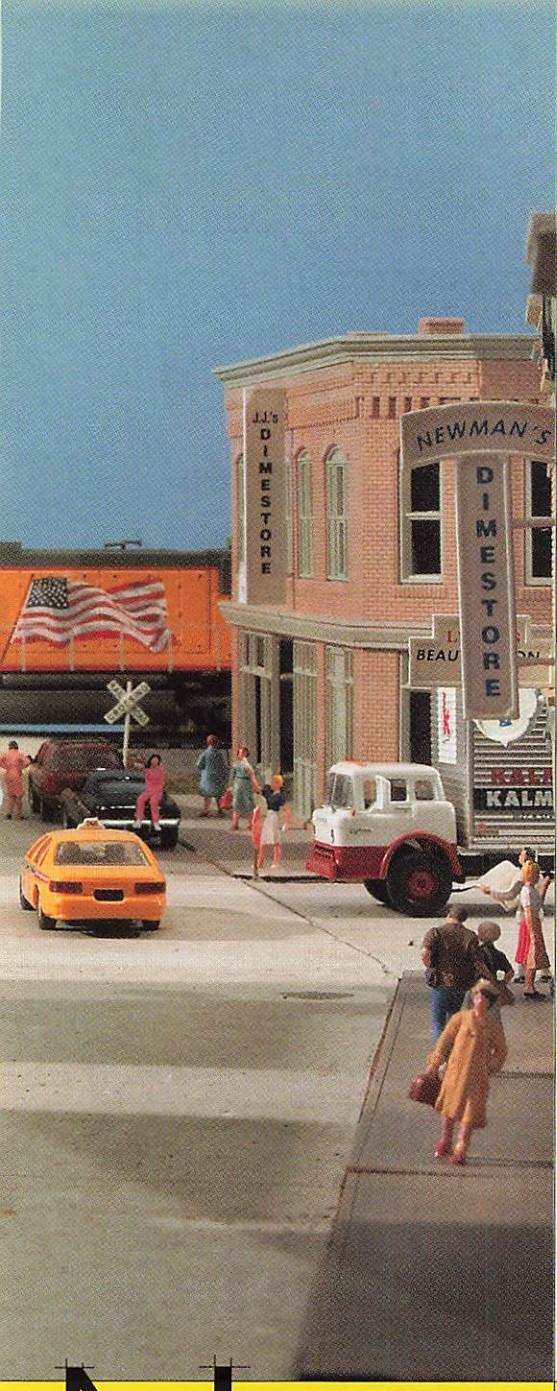
Now turn the page and see how the techniques we've covered have been applied to a sampling of layouts. #



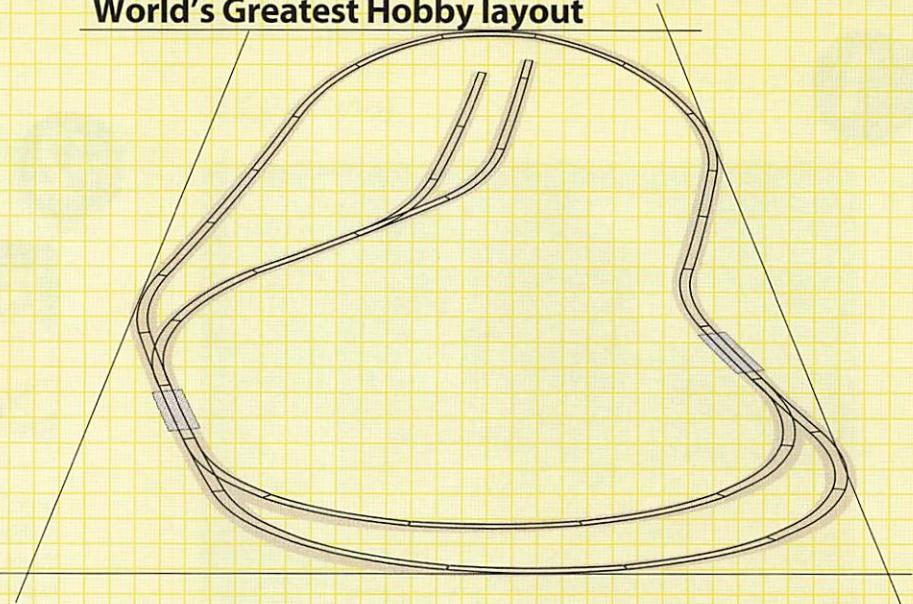
This layout was built especially for the World's Greatest Hobby promotional campaign and is the subject of the accompanying DVD. Built to illustrate how simple it is to get started in model railroading, the layout (as shown in this photo) has lots of variety: urban structures, figures and vehicles, detailed scenes, trees, industry, hills, and railroad operation.

As **easy** as it gets

Built to promote the hobby, this 4 x 8 layout has it all



World's Greatest Hobby layout



SCALE:
HO

CONTROL:
DIGITAL OR DC

SIZE:
4'x8'

SETTING:
SOUTH CENTRAL UNITED STATES

Never built an HO scale layout? Have we got a deal for you. This 4 x 8 may be the perfect candidate for your first model railroad. Its track plan is simple, its benchwork is basic, its wiring is plain vanilla, and its scenery is easy enough to give you confidence when you're ready to start on your second layout.

Best yet, the DVD that accompanies *Model Trains Step by Step* is based on building this railroad. So, if you have questions as you

begin building the layout, most of them will be answered on the DVD. We recommend that you watch the program from start to finish at least once. Next, take the list of materials to the hobby shop and home building center to purchase the products you'll need (or equivalents). Figure that it will probably take you a week of evenings – at most, two – to build this layout.

So, roll up your sleeves. You're ready to begin the adventure of a lifetime!

STEP 1

BENCHWORK

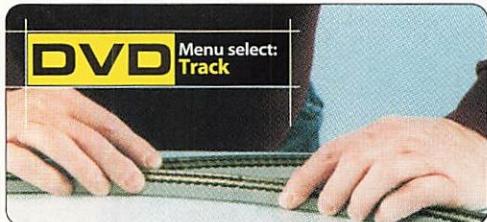


DVD Menu select:
Benchmark

The most important requirement of benchwork is stability. Over the years, *Model Railroader* magazine has built 4 x 8 layouts that rested on bookshelves, L-girder benchwork, sawhorses, and large cardboard boxes. Choose the support that works best for you. The benchwork featured on the DVD is lightweight, relatively inexpensive (because very little wood is wasted), easy to build, portable (you can disassemble it, move it, and reuse it), and stable. Throughout *Model Trains Step by Step* you'll see other approaches to benchwork. Feel free to use or adapt those.

STEP 2

TRACK

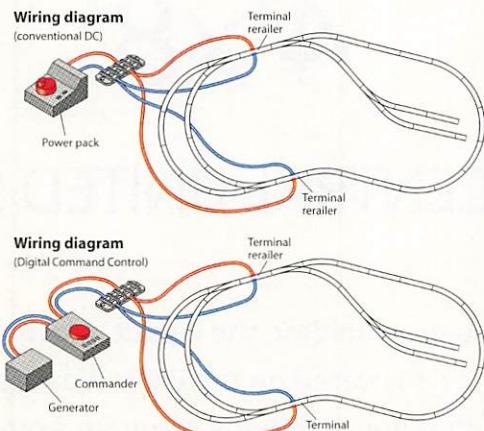


Ten years ago, the next step would have been to lay your roadbed material on the plywood base and lay the track over the top of that. Then you'd spread ballast on the track and roadbed,neaten it, wet it down, and dribble thinned white glue over it to cement the ballast in place. Fun, but time consuming. In recent years, however, manufacturers have recognized how important your time is, so they've combined roadbed, simulated ballast, and track into individual sections.

With your tabletop in place on the benchwork, lay out the track in the configuration shown on the track plan. Snap the sections together, and when you have the track where you want it, tack the sections in place. Follow the track plan and the DVD closely.

STEP 3

WIRING



Here's where you start to have choices. Do you want to wire the layout for basic direct current (DC) control, or do you want to step right into the world of Digital Command Control (DCC)? In either case, with a simple layout like this, wiring is a snap. All you need to do is follow the accompanying diagram wire-for-wire, color-for-color (or substitute your own colors).

The DVD shows you how to wire the layout for DC control; should you choose to go with DCC, the wiring diagram and manufacturer instructions are your guide. How do you decide? Well, DC wiring is



DVD Menu select:
Control

plenty adequate for this small layout where everything is within reach. The track plan is simple, and you probably won't run more than one train at a time. The beauty of DCC, however, is that it allows you to control many functions on the newest models:

lights, horn/whistle, speed, and engine noises. If you know you're going to build a bigger railroad eventually, this would be a good time to learn how DCC works (see page 66).



MATERIALS

TABLE

4 x 8-foot sheet $\frac{1}{2}$ " birch plywood, ripped into 3" strips (1)
 4 x 8-foot sheet $\frac{1}{2}$ " plywood (1)
 8" lengths of 2 x 2 (4)
 8-foot lengths $\frac{1}{4}$ " x $1\frac{1}{4}$ " wood molding (2)
 T nuts, $\frac{1}{4}$ " (4)
 carriage bolts, $\frac{1}{4}$ " x 2" (20)
 washers, $\frac{1}{4}$ " (20)
 lock nuts, $\frac{1}{4}$ " (8)
 wing nuts, $\frac{1}{4}$ " (12)
 Carpenter's glue

TRACK

9" straights (11)
 18"-radius curves (20)
 3" straights (2)
 left-hand switches (2)
 right-hand switches (2)

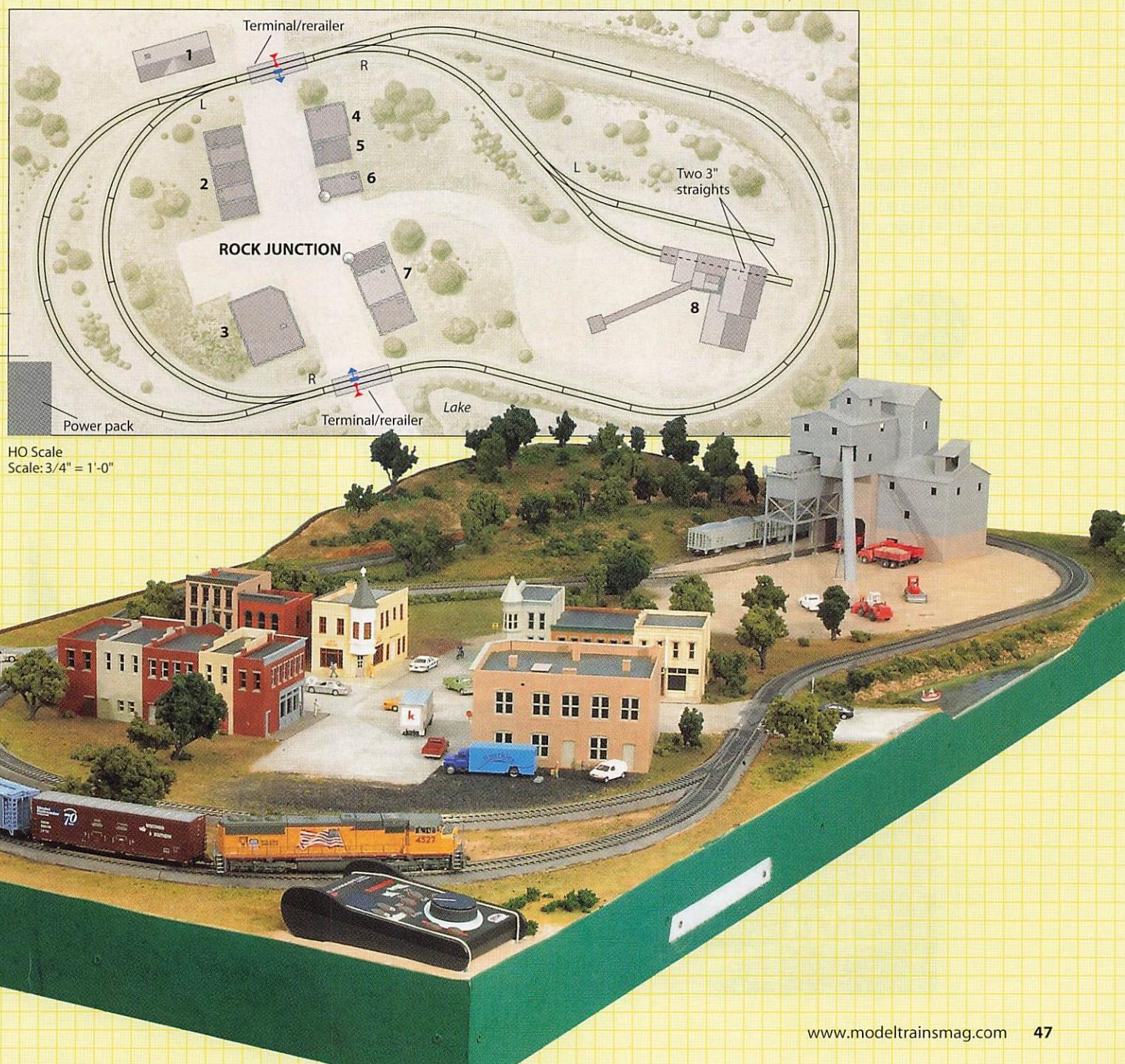
...OR READY-TO-USE WGH TRACK PACKS

489 Atlas track pack
 44596 Bachmann track pack
 3103 Kato track pack

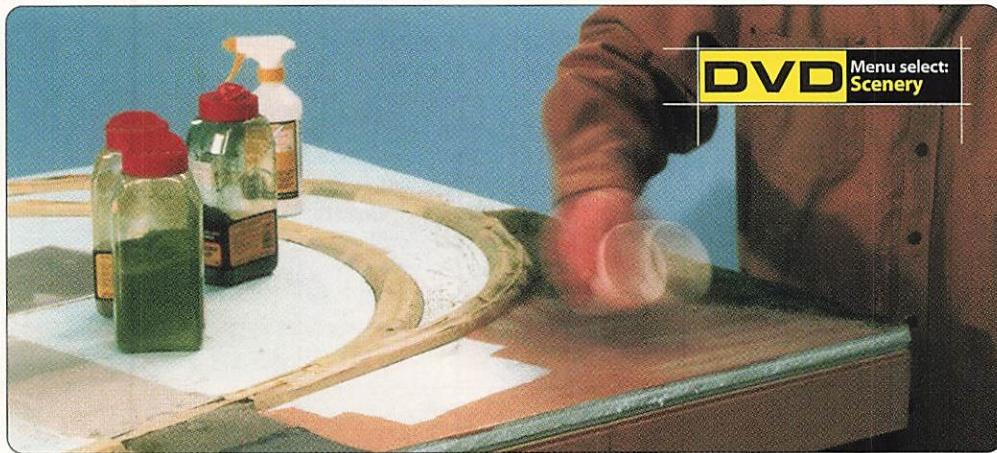
WALTHERS BUILDINGS

1.* 3063 Clarkesville Depot
 2. 3028 Merchant's Row I
 3. 3064 Merchant's Row III
 4. 3002 Bill's Glass Shop
 5. 3000 Don's Shoe Store
 6. 3034 Adam's Ribs Restaurant
 7. 3029 Merchant's Row II
 8. 3062 Glacier Gravel Co.

*Corresponds to numbers on track plan below



HO Scale
 Scale: 3/4" = 1'-0"

STEP 4**SCENERY**

To this point, nothing about this layout is unique. Benchwork, track, wiring – all the basic principles described elsewhere in *Model Trains Step by Step* apply to this layout. What makes a layout unique, however, is the scenery. The landforms and rock formations on the WGH layout are basic and easy to build.

Start by watching the DVD again, read the scenery chapter at the front of *Model Trains Step by Step*, browse through some of the other projects, look at the accompanying photos, and then begin work on your layout!

Here's a chance to get your hands messy. And don't worry about making mistakes; no mistake is permanent. You're working with water-soluble materials, so all you need to do is repaint. This layout is a great learning layout because it has a little of everything: flat terrain, depressions, water, hills, grass, trees, pavement, and gravel. There's no right or wrong here. It's your layout. Put the trees where you think they look good; move the lake and hills to another place (just be sure to cut the fascia to match their new location). This is a great time to learn techniques and experiment.

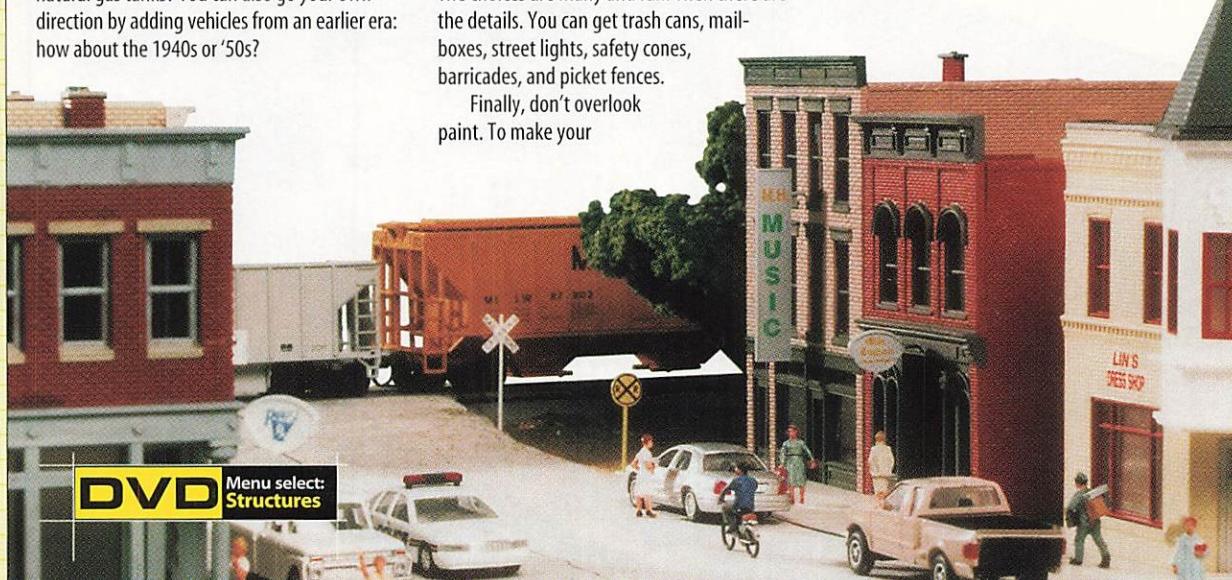
STEP 5**STRUCTURES AND DETAILS**

A second element of layout building that can make your layout unique is structures and details: i.e., buildings, vehicles, figures, and miscellaneous items. The structures you include on your layout don't necessarily need to be exactly the same as on the layout pictured here. Instead of a gravel operation, how about a scrapyard? Or maybe a fuel dealer with coal piles and oil or natural gas tanks? You can also go your own direction by adding vehicles from an earlier era: how about the 1940s or '50s?

Visit your local hobby shop or check out a hobby catalog to see what kinds of figures are available. You'd be amazed at the possibilities: military personnel, railroad workers, railroad passengers, sitting figures, and standing figures. On this layout we put a rowboat in the lake; you can buy swimmers or divers (legs only so they look like they're partway in the water). The choices are many and fun. Then there are the details. You can get trash cans, mailboxes, street lights, safety cones, barricades, and picket fences.

Finally, don't overlook paint. To make your

structures look different from everyone else's, paint them different colors. Spreading thinned washes of earth tones over your buildings flattens the plastic shine and gives them a "weathered" look – exactly the look we want to achieve. The idea is for you to use your imagination to build your own unique layout.

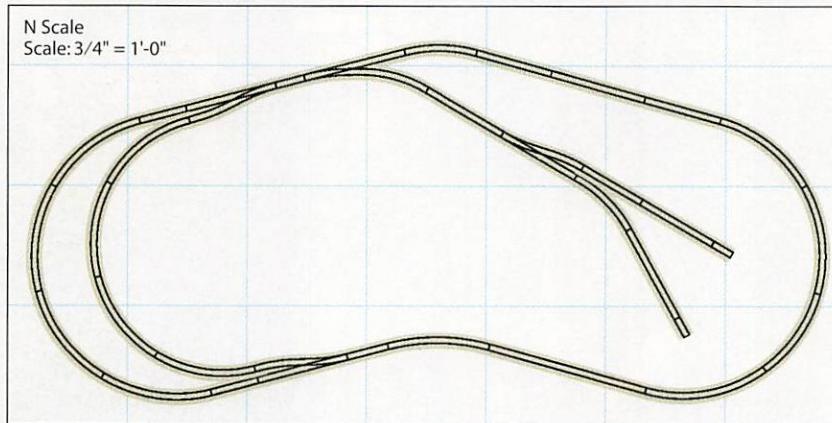


And lastly, the cars and locomotives you choose to run on your layout is up to you and will tell those who view your layout a lot about it. For instance, if you buy a steam locomotive for your version of the WGH layout, you're telling everyone that the layout is set prior to about 1960. If you have a new diesel on the mainline loop and leave a tired old steam switcher on the passing track or working the siding, you're telling visitors the layout is set in the steam-diesel transition era (roughly 1945-1960). If you choose to run an Atchison, Topeka & Santa Fe locomotive and finish your scenery to look like the desert, viewers will think desert Southwest. A Boston & Maine diesel and a waterfront scene places your layout somewhere in the Northeast.

One of the many fun things about model railroading is the research you can do to be "prototypically accurate." If you're running an ATSF warbonnet F unit, the cars you pull behind should be from the same era and carrying heralds of other contemporary and same-region roads: Southern Pacific, Union Pacific, for example. One thing to keep in mind is that this is a small layout with relatively tight curves; the cars and locomotives you purchase and run should not be of the modern-era long-wheelbase variety. Your hobbyshop owner can guide you in your rolling stock purchases.



SAME PLAN, N SCALE



Here's an N scale version of the HO track plan featured here and on the *Model Trains Step by Step* DVD. Why N scale? There are plenty of excellent reasons to choose this scale, including the ability to pack more railroad action into less space.

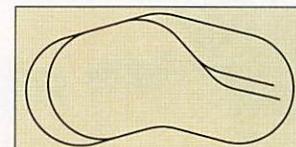
N scale track and trains are roughly half the size of HO – 54.5 percent the size of HO to be precise – and just 1/160th the size of real railroad equipment.

This means the same 4 x 8-foot HO track plan can be built in N scale in a bit over 2 x 4 feet. If you have a little more space you can reap the visual and operational benefits of wider curves and longer sidings and still be comfortably under 4 x 8 feet.

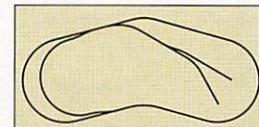
The N scale plan shown here needs a 3'-6" x 7'-0" space. Although the track arrangement is the same as the HO version, this railroad makes extensive use of more-realistic sweeping 13 1/4" curves.

This plan uses sectional N scale Kato Unitrack, which includes ballast and subroadbed detail for a neat, finished appearance right out of the package. Kato's no. 4 turnouts work well using either a DCC system or a DC power pack.

So, if you don't have enough room for a 4 x 8 railroad, remember that just about any of the track plans shown in these pages can also, with only minor adjustments, be built in N scale.



HO scale layout (4 x 8 feet)



N scale layout (3'-6" x 7'-0")

MATERIALS

Kato

- 20-000 248mm straight track (4)
- 20-010 186mm straight track (4)
- 20-020 124mm straight track (4)
- 20-041 feeder track (1)
- 20-048 bumper track (2)
- 20-120 R315-45 curved track (4)
- 20-130 R348-30 curved track (4)
- 20-132 R348-45 curved track (8)
- 24-843 adapter cord (1)
- R315-45 curved track (4)
- 20-220 electric turnout no. 4, left (2)
- 20-221 electric turnout no. 4, right (2)

AND THAT'S ABOUT IT.

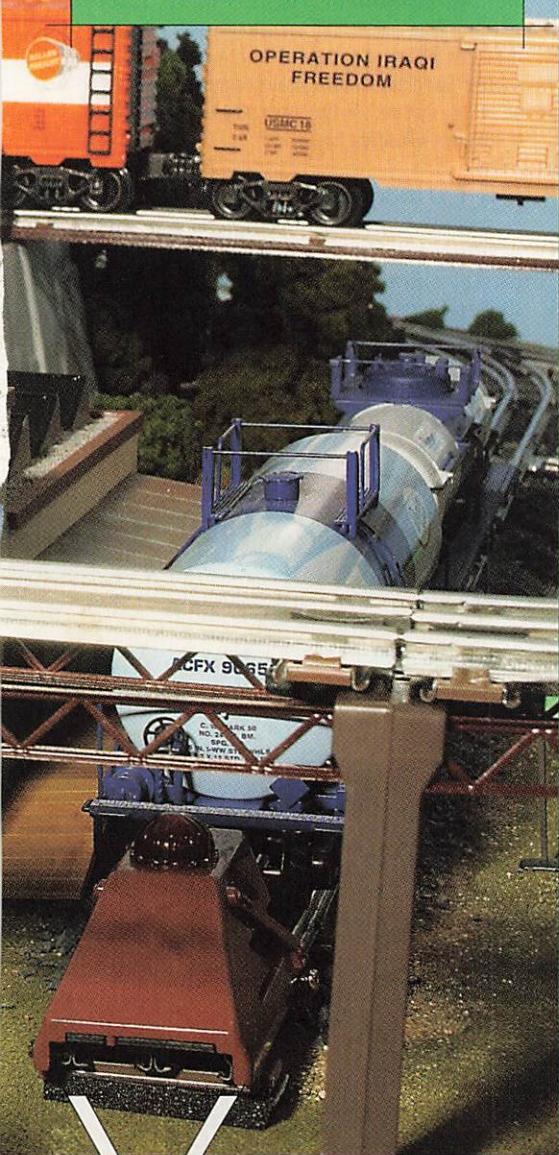
You can now consider yourself an experienced model railroader. Best of all, you have the knowledge to build any other layout in this book, and you know enough to be able to ask the right questions that will enable you to build more-complex layouts in the future. Enjoy the hobby! #



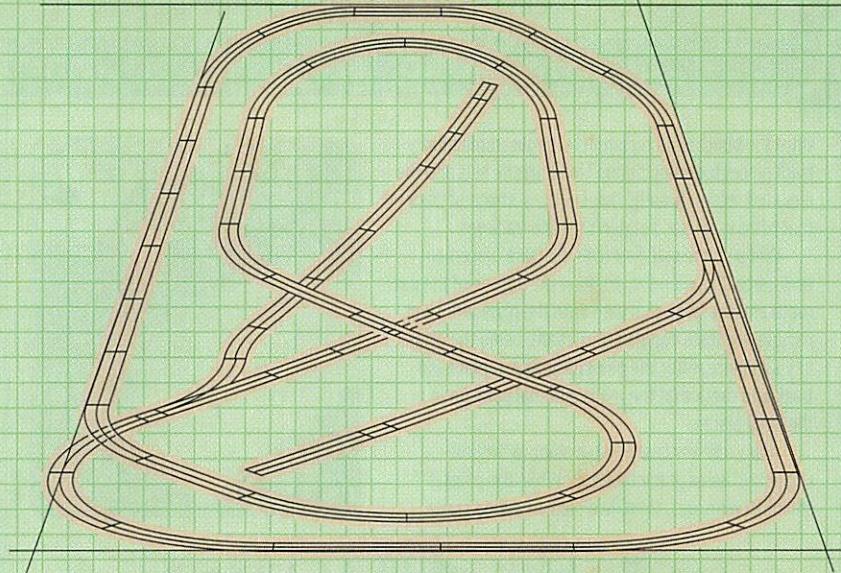
Over and under on the Lionel Lines

Elevated track supports make this layout double the fun

Want plenty of running room on a 4 x 8-foot layout? Look no farther, because this nifty track plan extends the mainline up and over itself using a set of Lionel graduated trestle piers.



Coal Terminal & Trestle Railroad



GAUGE:
O
CONTROL:
AC POWER PACK
SIZE:
4'x8'
SETTING:
MIDWEST UNITED STATES

You bought a train set. The kids (or grand-kids) play with it endlessly, and now they want more. But how do you move from an oval of track on the floor to a permanent, free-standing layout?

Welcome to the Coal Terminal & Trestle Railroad – an O-gauge layout based on a Lionel starter set.

To make the most of the train set components, the CT&T uses Lionel O-27 tubular track. While you don't have to stick with

O-27 track, keep in mind that other brands use slightly larger 31"-diameter curves, so you won't be able to build a layout exactly like this one and have it fit on a 4 x 8 sheet of plywood.

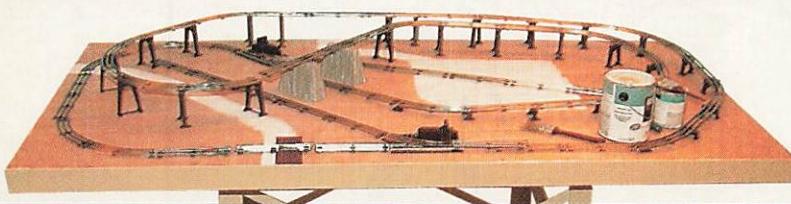
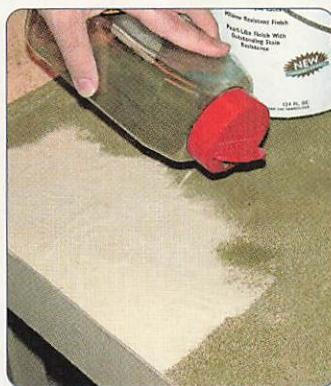
To begin, we took the path of least resistance regarding benchwork and assembled the tabletop and legs from two sheets of $\frac{1}{2}$ " birch plywood. For specifics on building benchwork, refer to the chapter on benchwork.

PRELIMINARY TRACKLAYING

Once the benchwork is complete, begin connecting track pieces together. Set up Lionel trestle sets and the elevated section loosely. Overlap the sections of track that need to be cut, but don't cut the track yet.

When you're satisfied with the track placement and spacing, use a pencil to draw the outline of the dirt roads and the large coal yard onto the plywood. Then remove the track and paint the roads, using the color of your choice. After the paint has dried, replace the track and check that the roads and coal yard are in the right places.

Apply a heavy coat of latex paint to the still-unpainted areas of the tabletop. While the paint is still glistening wet, sprinkle on foam ground cover.



MATERIALS

TRAIN SET

We started with a Lionel O-27 diesel set (no. 31915), but you can choose any set from any manufacturer. Keep in mind that this layout uses Lionel O-27 track. If your set uses another type of track with a greater diameter, you won't be able to use that track on this layout. Any 40-watt or greater transformer will do just fine.

Lionel O-27 track pieces

We needed to buy track, switches, Lionel trestle sections, and a bridge and piers for the layout. You can use the Lionel graduated trestle sections and bridge, similar products from another manufacturer, or make your own. The asterisks denote that the total number of straight and curved sections in the list includes the eight straight sections and eight curved sections that came with our train set.

We used foam insulation tape to keep the layout reasonably quiet during operation. To install the foam tape, peel off the paper backing and press the tape snugly into the underside of each track tie. Strips aren't needed beneath the track sections on the elevated trestle portion of the layout.

Looking at the track plan, be sure to identify the four sections of track that call for insulated center-rail pins. Using these pins in appropriate locations on the CT&T allows you to park a locomotive on a siding while another locomotive is running on the main line, or vice versa. To install a pin you first must remove the existing steel pin. Flip the track over and use a screwdriver to gently pry open the rail seam. Pull out the metal pin and replace it.

Once all plastic pins are in place, join the track pieces together, leaving temporary gaps where the odd-length sections go.

Attach the trestles in proper order to the underside of the elevated sections of track, following the instructions inside the trestle box. You're ready to cut sections of track to fill five odd-sized gaps.

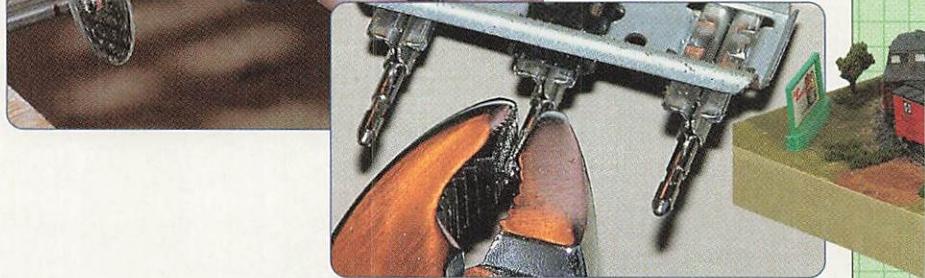
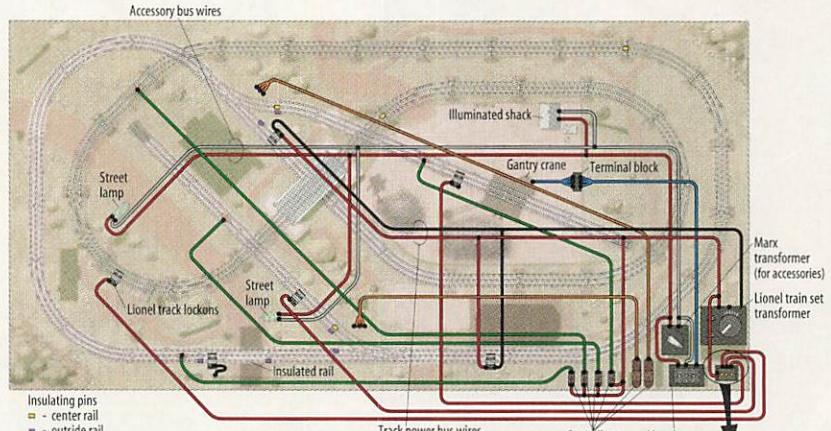
We used a Sharpie pen to mark the cut line on the undersides of the rails. Then we secured each section in a vise, sandwiching it between two pieces of scrap wood to keep the jaws of the vise from damaging the rails. We cut each section as designated (1 1/4", 2", 3 1/2", 5", and 5 1/4") using a rotary cutting tool. A hacksaw with a fresh fine-tooth blade works great also. In either case, wear eye protection. Clean up any rough edges with a flat file.

Save the center-rail insulators from your discarded track ties. You'll need these small pads to insulate the outside rail nearest the crossing gate.

Remove the rail from this piece of track by prying open the crimped metal tabs on each of the three ties. Position an insulator on each tie and replace the rail, making sure that metal isn't touching metal, then recrimp the tie's tabs.

When all the pieces are in place, make sure your connections are snug and the track is centered on the top of the layout. You're ready to fasten the track to the surface.

TRACK PREPARATION AND WIRING



Lionel (track and switches)

- 12715 illuminated bumper set (1)
- 12730 girder bridge (1)
- 12744 rock pier set (1)
- 12754 22-piece graduated trestle set (1)
- 12755 10-piece elevated trestle set (1)
- 12841 insulated straight track section (1)
- 62900 CTC lockons (6)
- 65014 half-curve sections (1)
- 65033 curve sections (20)*
- 65038 straight sections, including pieces to be cut (32)
- 65041 insulating pins (12)
- 65121 remote-control right-hand switch (1)
- 65122 remote-control left-hand switch (1)
- 65149 remote control uncoupling sections (4)

Lionel (accessories)

- 1.* 11975 freight accessory pack (station and shanty)
- 2. 12714 automatic crossing gate
- 3. 12839 vehicle grade crossing
- 4. 12926 globe street lamps 3-pack
- 5. 12943 illuminated station platform
- 6. 14121 classic billboard set 3-pack
- 7. 14134 magnetic gantry crane
- 8. 32923 36-watt accessory transformer

SCENERY SUPPLIES

- Ballast King coarse gray rubber ballast
- K-line coarse coal
- latex paint (tan, green, black)
- Mountain Modelcraft Perfect Coal (fine)
- Mountains in Minutes Polyfoam paintbrushes
- Plastruct BFS03 $\frac{3}{32}$ " x $\frac{3}{64}$ " Fineline

I-beam pack strip styrene

- Plastruct OWTS-16 open web truss, Warren style
- Provo Craft Lil' Stuff fences (Ben Franklin stores)
- Red Devil one-time lightweight spackle
- Scenic Express CM1830 O gauge station, EX0300 black steel drums, PL0003
- O scale large tree stumps, and PL-830
- HO retaining walls

Woodland Scenics burnt grass ground foam, brown fine ballast, gray fine ballast, green deciduous trees, green conifer trees, medium-green coarse turf, and weeds fine turf

DIE-CAST VEHICLES AND FIGURES

- Ertl 310SE John Deere backhoe
- Joyal Akerman track excavator

Langley Models no. OF4 gardeners set and no. OF11 workmen and tools

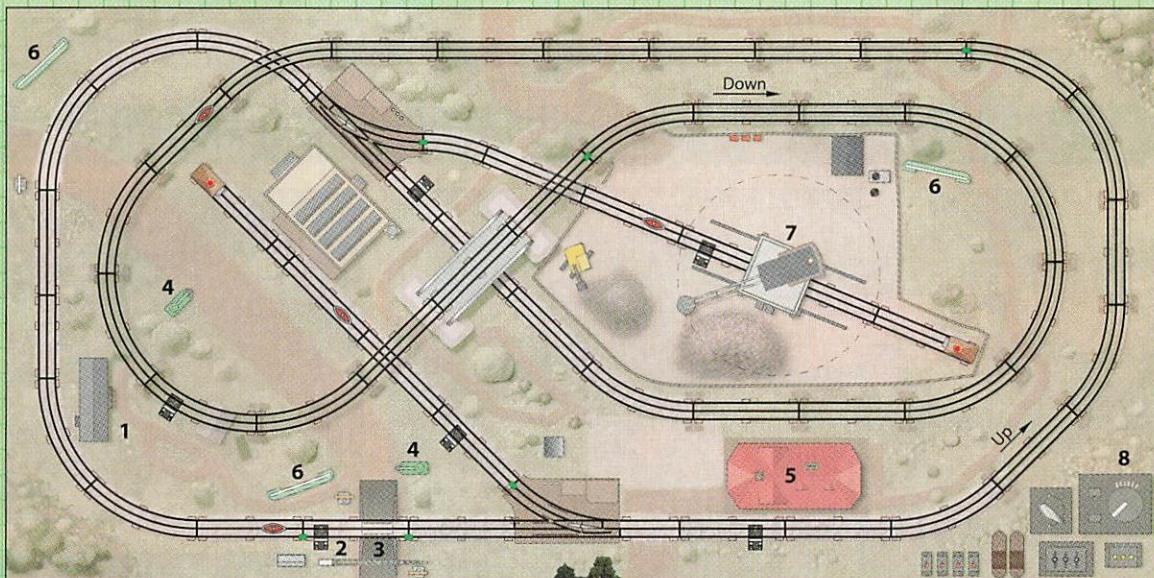
Life-Like no. 1145 O scale railroad signals and signs

Matchbox 1946 Dodge power wagon Figures from K-Line, Life-Like, Lionel, Model Power, and MTH

MISCELLANEOUS SUPPLIES

- Assorted drill bits
- Foam weather strip (70 feet)
- No. 4 roundhead $\frac{1}{2}$ " wood screws (for trestles)
- No. 6 roundhead $\frac{3}{4}$ " wood screws (to attach bases of trestles to tabletop)
- 4" plastic cable ties (2 packs of 100)

*Corresponds to numbers on track plan below



O-27 Scale
Scale: $\frac{3}{4}$ " = 1'-0"



STEP 3

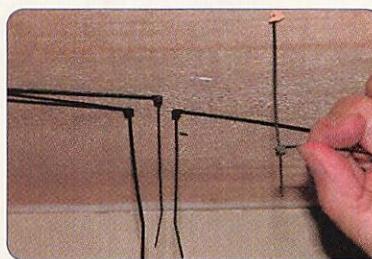
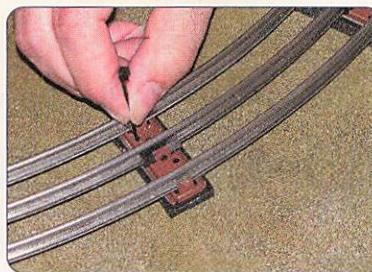
FASTENING THE TRACK

Cable ties, sometimes called zip fasteners or cable strap fasteners, are thin, ridged pieces of plastic with one plain end that loops into an opening on the other end. While cable ties are most often looped around an object and tightened, here we're using them in pairs in place of wood screws to hold the track down.

Once your trackwork is in its final position on the tabletop, start with one section and drill a hole, using a $\frac{3}{32}$ " drill bit, for the first cable tie. Hold down the track firmly as you drill into the table to keep the weather strip foam tape from moving.

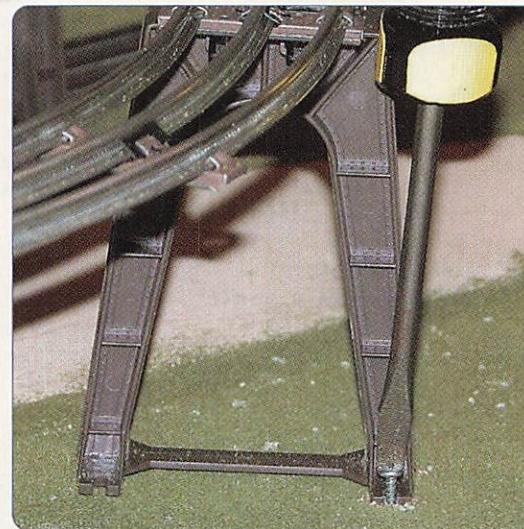
Take a cable tie, with its plain side facing down, and insert it all the way down through the hole in the track tie. From the underside of the table, slide the receiving end of a second cable tie onto the plain end of the first one. Make the cable tie connection as tight as it will go so that the foam insulation compresses slightly, lowering the track's profile.

Work your way around the layout, securing all the track that makes direct contact with the



plywood. When all you have left are the trestle tracks, you're ready for the next step.

STEP 4



STEP 5

VISUAL SUPPORT



The Coal Terminal & Trestle owes half its name to Lionel's popular elevated track supports, which certainly do their job holding the track aloft. Visually, however, they're not exactly complete — the track "floats" in the air between the brown plastic trestles. If that doesn't bother you, feel free to skip this step.

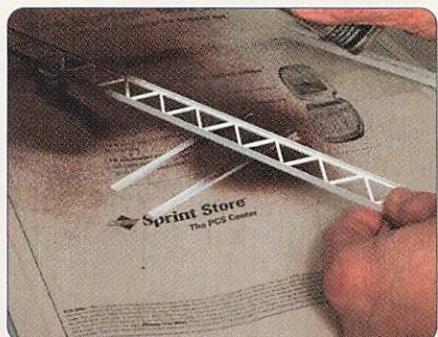
Plastic Warren-style open web trusses, a series of V-shaped steel pieces that join two horizontal I-beams, looked promising. We decided these trusses would give the elevated sections of track some visual support.

Several firms make these trusses in a variety of sizes. We settled on Plastruct OWTS-16 structural trusses, which were thin and flexible enough to bend around O-27 curves without breaking. Each section is roughly $\frac{1}{2}$ " high, $\frac{11}{64}$ " thick, and 9" long. We spray-painted the trusses with two coats of brown and set them aside to dry.

The pieces going beneath straight sections of track need no cutting. A 9" section wedged nicely between each trestle. We applied a dab of cyanoacrylate adhesive (CA) gel to the top of the truss where it touches the trestle. Then we held everything in place briefly until the glue set. Be careful not to get this glue on your fingers — it bonds skin instantly.

The curved sections were more challenging. Cutting the first two truss sections to fit was easy, but we soon discovered that one size would not fit all. We ended up measuring and cutting each section for a specific location.

Also, because we were reducing vertical clearances by an inch or more, we could not use the trusses on overpasses. A simple Plastruct L-shaped girder, glued directly to the sides of the track's metal ties, lent the appearance of support beneath the rails and avoided rooftop-peeling crashes along the underpasses.



TRESTLES

The trestles go up quickly once you've attached them to the underside of the track sections. Follow Lionel's instructions, and keep in mind that the black plastic insert pieces that come with the trestles slide into place.

Grasp each trestle so that it's sitting as flat as possible on the top of the table. Drill a hole (just big enough for no. 6 wood screws) at the slotted base of each pier. Then drive a screw into each hole, making sure the head of the screw secures the footings without distorting or bending the plastic trestle.

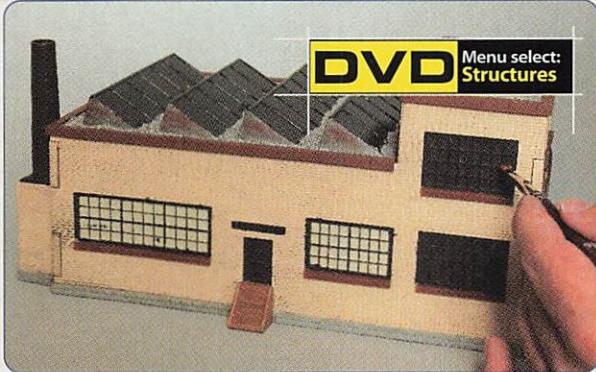
Installing the large stone piers near the center of the layout requires no special instruction beyond the directions supplied in the box.

When you've driven the last trestle screw, your trackwork is complete. It's time to test it. Using test leads with alligator clips, power up the various sections to see how well trains run.

There may be a few rough spots that need tweaking, depending on how well you've lined up your rail joints. If you need to make a change, just clip off the top of the cable ties, adjust the track, and install new fasteners.

STEP 6

STRUCTURES



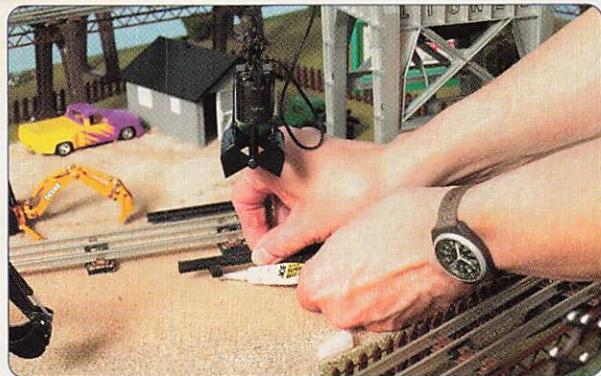
Our structures are pretty basic: a K-Line factory kit, a Plasticville hobo village kit, a resin Scenic Express train station, and a small MTH shack. As such, a few of them needed something more to fit in.

Take the factory. Cast in cream- and gray-colored plastics, the K-Line kit looks fine in a vintage Plasticville village but is a bit out of place in our green, ground-foam environment.

First, we brush-painted the plastic with colors close to the molded plastic (Model Master Acryl radome tan for the brick) and contrasting trim colors (Model Master Acryl burnt umber and rust). We used other colors: Model Master Acryl aluminum for "metal" parts, dark gray for "stone" parts, and gloss black for the skylight roof panels.

We finished the factory using Woodland Scenics fine gray ballast on the flat roof to simulate the gravel-and-tar roofs used on many commercial structures. Diluted white glue keeps the ballast in place.

Using the same Model Master paints, we transformed the hobo village into a collection of dark and dirty trackside buildings. Contrasting paints accentuate the patchwork look of the buildings, which are generally cast in only two colors of plastic. After the paint dried, we weathered the buildings using a wash of heavily diluted paint.



We knew Lionel's gantry crane/coal loader, an action accessory, would serve as the layout's focal point. We wanted to create a convincing yard around this fun-filled accessory.

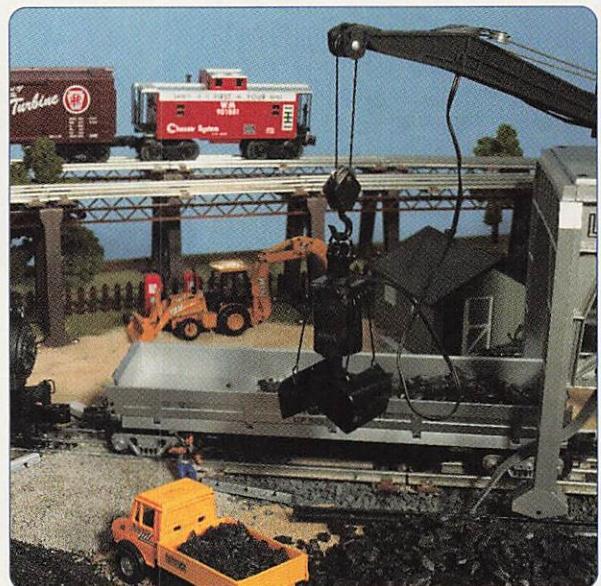
Since the crane has legs equipped with flanged wheels, we decided to give it some faux mobility by placing those wheels on rails. We used a hacksaw to cut apart two pieces of damaged GarGraves track to supply the rails and ties for the gantry crane. Once we had the rails positioned correctly, we glued the ties down to the layout surface.

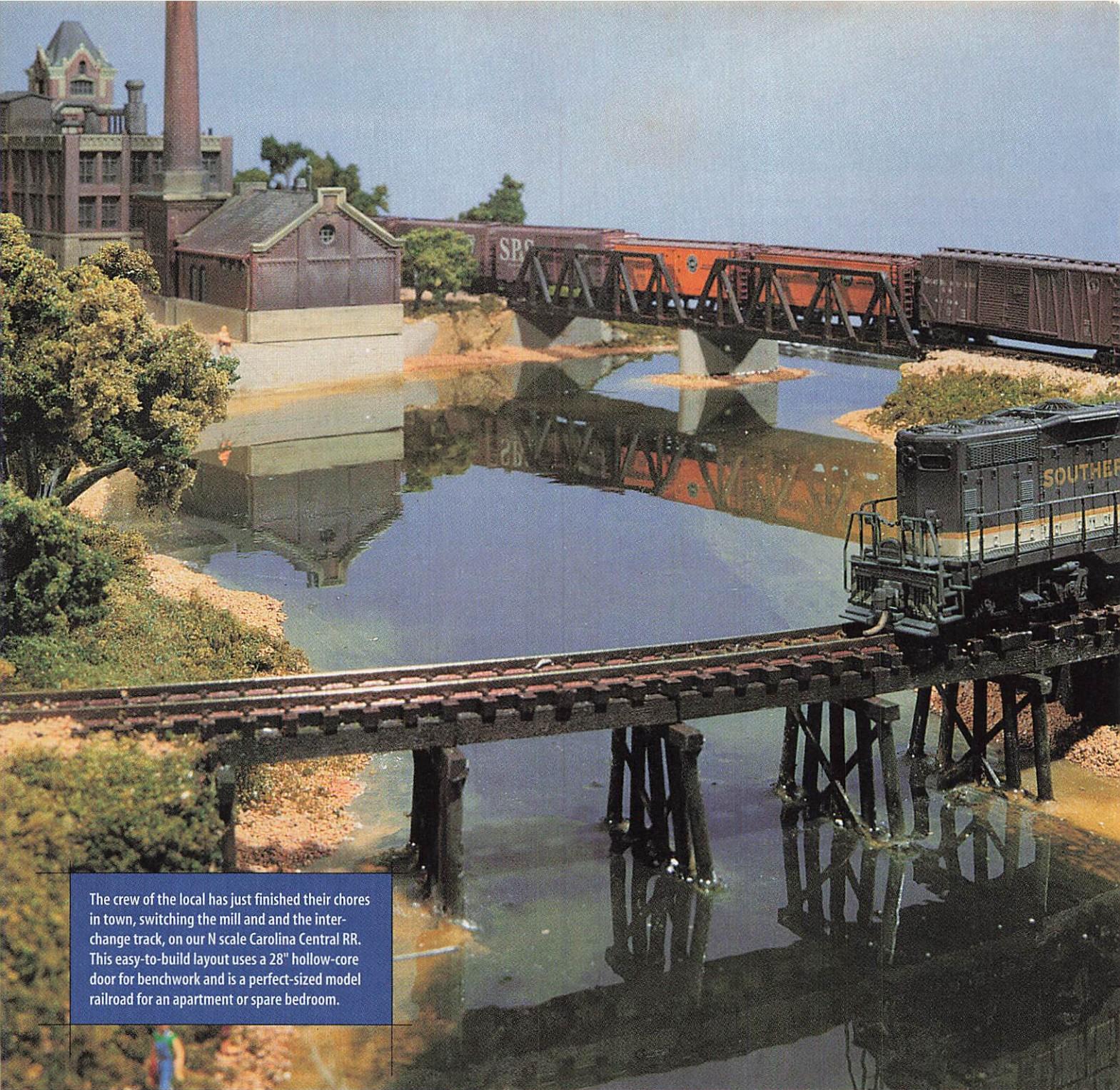
Naturally, a coal yard isn't much without big piles of coal. We glued retaining walls designed for HO scale layouts into place to keep the coal within reach of the crane's bucket.

Using Mountains in Minutes Polyfoam, we created a base for a pair of coal piles. After the mounds were solid, we painted them with Testor's flat black paint. After the paint had dried, we took two different sizes of coal, poured one size over each mound, and glued it in place. Finally, we poured some loose coal on top of our chunkier pile to allow anyone to load or unload coal using the crane's controller.

When we were done making the industrial yard, we decided to put a fence around it to satisfy local zoning codes. We spray-painted packages of white Christmas village fencing brown and glued them in place.

Finally, we completed the scene with a few die-cast metal earthmoving vehicles and some leftover GarGraves track ties (painted white), which serve as parking stops and debris retainers. For additional tips and techniques, see the chapter on scenery. #

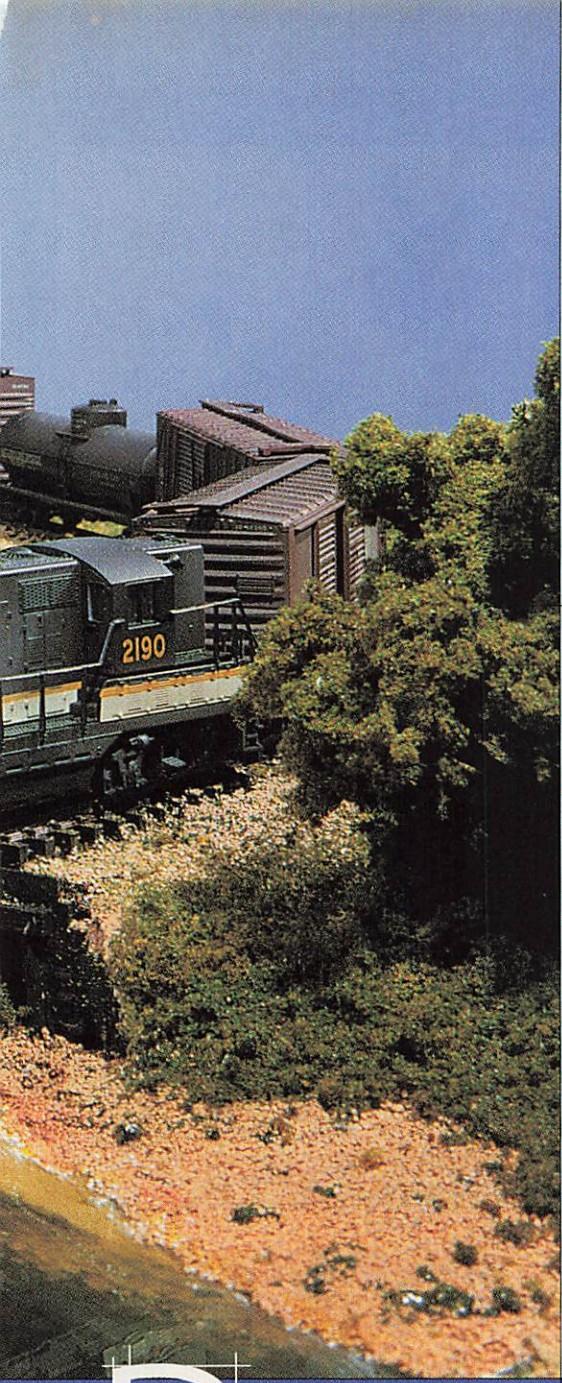




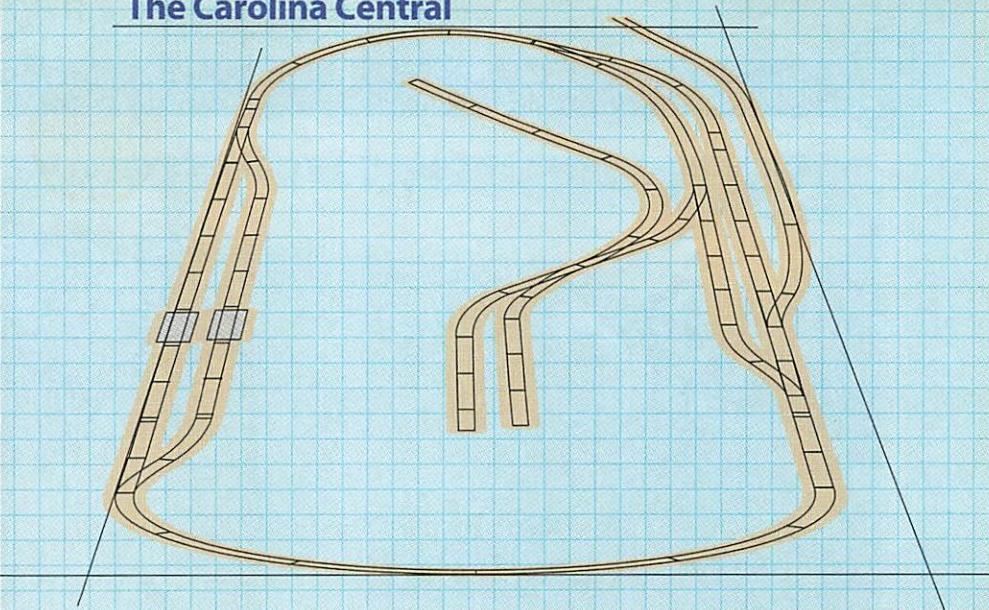
The crew of the local has just finished their chores in town, switching the mill and and the interchange track, on our N scale Carolina Central RR. This easy-to-build layout uses a 28" hollow-core door for benchwork and is a perfect-sized model railroad for an apartment or spare bedroom.

N scale on a door

A scenic river and a staging yard add excitement to this N scale layout



The Carolina Central



SCALE:
N
CONTROL:
DC POWER PACK
SIZE:
28" x 80"
SETTING:
**SOUTHEASTERN
UNITED STATES**

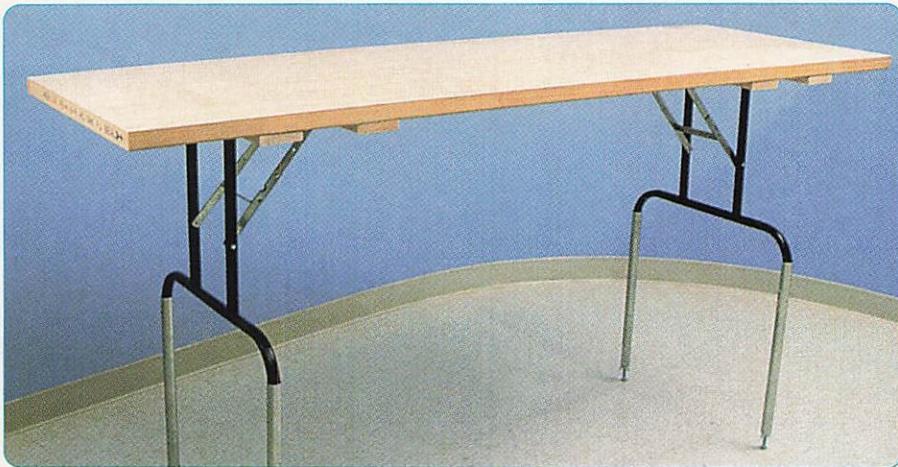
Because of its small size, N scale is great for making the most of your available space. Our Carolina Central layout is a free-standing railroad built on a 28" hollow-core door supported by folding table legs. We set the Carolina Central in the 1950s and designed it to be a subsidiary of the Southern Ry. located somewhere near the Blue Ridge Mountains. The track plan features several rail-served industries, a passing siding, and an interchange track

with the Seaboard Air Line. For added operating interest, we included a two-track staging yard, giving trains a place to travel "beyond the layout." The layout also has a large scenic river. The Carolina Central is a good plan for beginners looking to build their first layout. However, the layout also has enough scenic and operating features to work for more-experienced modelers who find themselves downsizing or just wanting to try modeling in a different scale.

STEP 1

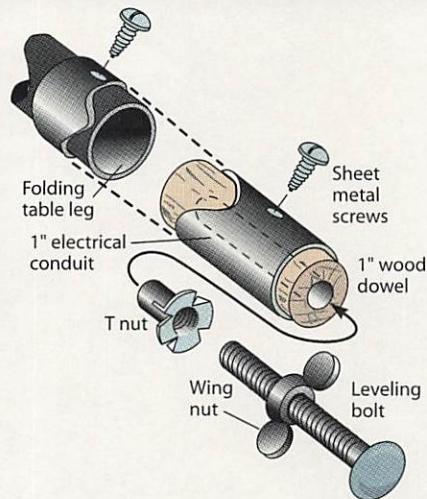
BENCHWORK

Photos by Kalmbach Photo Studio • Illustrations by Rick Johnson



Unlike most of the other projects in this magazine, the foundation for the Carolina Central is a 28" x 80" interior hollow-core door. (Check your local home and building center for damaged doors. As long as it's structurally intact, a flat door with a few dents in it should work fine and save you some money.) We used folding table legs to support the layout, though you could easily set the door on a table, sawhorses, or even a few sturdy boxes. The folding legs offer the advantage of making the layout self-contained.

The folding legs are mounted on 1 x 4 supports screwed to the underside of the door. (Be sure you attach the legs to the 1 x 4s – by itself, the door's thin surface cannot support the legs.) Cut four 1 x 4s 28" long and apply a bead of Liquid Nails. Place each 1 x 4 in position and secure it with drywall screws. Keep the screws about 1" from the edge, since the center of the door is hollow. To raise the layout to a more-comfortable height, we added leg extensions using 1" electrical conduit. We slipped a 20"-long piece of electrical conduit

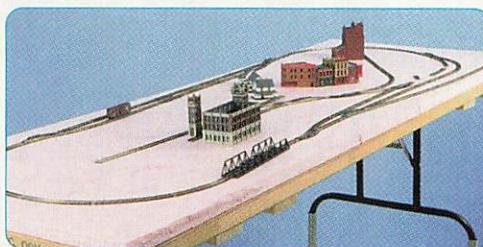


over each leg and fastened it in place with sheet metal screws. (If you don't want to drill pilot holes into the conduit and legs, you could use epoxy.)

We made the legs adjustable by adding leveling bolts and T nuts. After screwing a 1" dowel into the bottom of each leg, add the T nuts and leveling bolts as shown in the illustration above. The wing nuts are used to lock the bolt in place once the table is level. When finished with the legs, flip the table over and adjust the leveling bolts. Our finished table height is 42".

STEP 2

FOAM SCENERY



Any model railroad looks better when the scenery extends above and below the track. We used a piece of 1" foam insulation board as a base for the whole layout, cutting it to match the door. (See the scenery chapter for tips on working with foam.) We then laid out the track and some of the key buildings to get a feel for the layout. (Don't worry about the flex-track sections at this point.) Once you're happy with how things look, mark the locations of the track, structures, bridges, and river on the foam with a marker.

Next, remove all the items and cut the river out of the foam with a sharp utility knife. Glue the remaining pieces of foam to the door with latex Liquid Nails construction adhesive. To get the foam to lay flat, place heavy objects such as books on top of it. Let the foam dry overnight before proceeding.

After laying the roadbed and track, we came back and built the hillside out of foam as well, gluing and stacking it in layers.

STEP 3

ROADBED



We used N scale cork roadbed under our track to cut down on noise and make the layout look more realistic by raising the track above ground level. To apply the cork to the layout, break the sections in half along the pre-cut perforation, and spread some glue along the track center lines. (We used Elmer's Carpenter's Glue.) Place one section of cork against the center line and secure it with push pins while the glue sets. Next, place the second half of the cork snugly against the section that's already in place as shown above.

You'll need to cut and fit roadbed sections around turnout locations, but the cork cuts easily with a sharp hobby knife. Once the glue dries, remove the push pins.

MATERIALS

BENCHWORK

28" x 80" interior door
1 x 4 lumber, 28" long (4)
folding table legs
1" electrical conduit, 20" long (4)
Liquid Nails for Projects (2)
drywall screws
1" hardwood dowel, 18" long (4)
1" foam board, 4 x 8 sheet (1)
T nuts, bolts, and wing nuts (4 each)
sheet metal screws (8)

TRACK (Atlas) AND ROADBED

2500 30" flextrack (3)
2501 5" straight (28)
2509 Snap Track assortment (2)

2510 9 $\frac{3}{4}$ "-radius curve (6)

2520 11"-radius curve (9)
2521 1 $\frac{1}{2}$ 11"-radius curve (2)
2538 insulated joiners (1 pack)
2539 terminal joiners (3 pairs)
2546 Warren truss bridge (2)
2517 rerailer (2)
2702 standard left-hand turnout (4)
2703 standard right-hand turnout (4)
3019 Midwest Products N scale cork roadbed (14)
308 Micro-Trains uncoupling magnet (2)

single-pole double-throw switch (1)

$\frac{1}{8}$ " two-pole jack and plug
electrical junction box (1)
blank cover plate (1)
220 Model Rectifier Corp.
Tech 4 power pack

5. Design Preservation Models

512 Roadkill Cafe
6. Heljan 601 restaurant
7. Walthers 3224 Merchant's Row II
8. American Model Builders 601 General Service Building
9. American Model Builders 604 Transfer Building
Blair Line no. 67 timber trestle

ELECTRICAL AND CONTROL

single-pole single-throw switches (2)

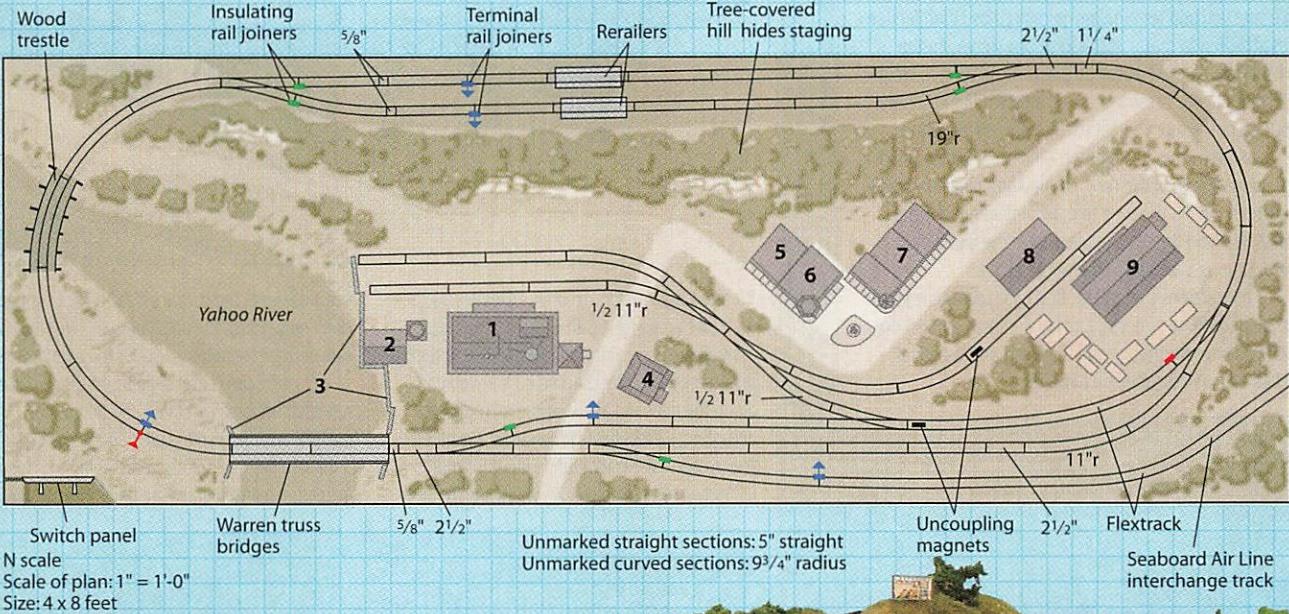
STRUCTURES

- 1.* Walthers 3253 American Hardware Supply
2. Model Power 1546 Holland Iron & Steel
3. Pre-Size 212 N scale cut stone retaining wall (2)
4. Atlas 2845 Kate's Colonial Home

MISCELLANEOUS

push pins
wood carpenter's glue

*Corresponds to numbers on track plan below

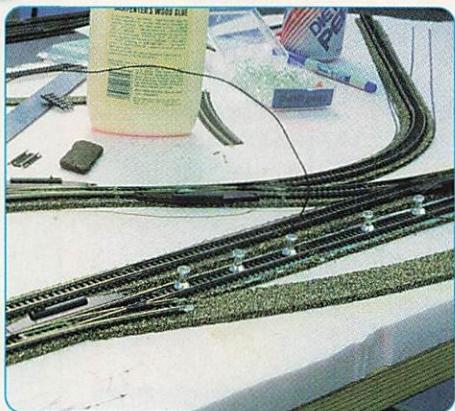


N scale
Scale of plan: 1" = 1'-0"
Size: 4 x 8 feet



STEP 4

TRACK



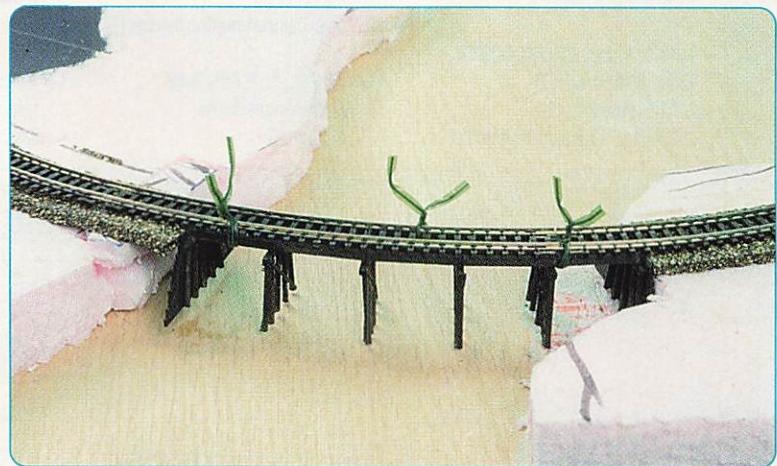
Assemble sections of the track on top of the roadbed. Make sure you add terminal rail joiners (those with feeder wires attached to them) at the locations shown on the track plan on page 59. Also add plastic insulating rail joiners where shown. These are very important for wiring the layout, so make sure you get them in the correct places.

Once the track is fit together, run a thin coat of Elmer's glue along the top of the cork roadbed and place the track in position. (This is the time to make any minor adjustments!) We held the track in place until the glue dried with push pins as shown in the photo above.

For the sections that call for flextrack, follow the steps used on page 76 to size, cut, and lay the flextrack sections. When you have finished laying the track, you can paint and ballast it as described on page 79.

STEP 5

BRIDGES



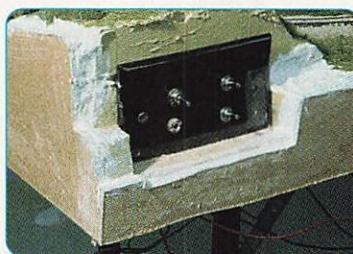
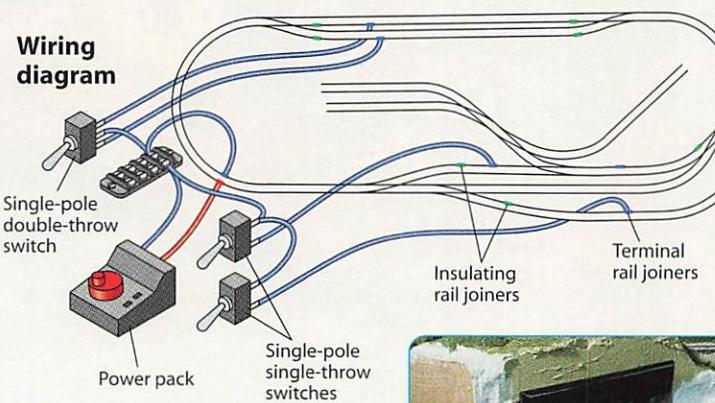
We used two Atlas Warren Truss bridges and a Blair Line wood trestle kit on the layout. After assembling and painting the wood trestle (before laying the track), we checked how it would fit along the river and adjusted the foam scenery accordingly. After the track was laid, we glued the trestle to the track with carpenter's glue, using twist ties to hold everything in place until

the glue dried. Don't worry if the bridge supports don't quite touch the door surface — we'll take care of that later when we pour the river bottom.

To make the center support for the two Warren Truss bridges, we cut a 1" section out of a plastic Atlas bridge pier and made a new cap for it out of a piece of .020" styrene. A block of foam insulation painted gray would work equally well.

STEP 6

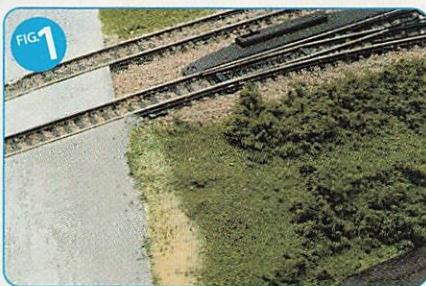
WIRING



The Carolina Central's wiring is simple, yet allows you to operate the railroad with more than one train. By adding several on/off switches, you can hold trains in staging, on the passing siding, or on the interchange track while running a train on the main line. This way, you can simulate meets by having one train wait on the siding while another rolls through town.

We used an electrical box for our control panel, drilling a hole through the box and the door to connect the wires to the track feeders. All the toggle switches are mounted in holes drilled in a plain plastic cover plate. The power pack's output wires plug into an $\frac{1}{8}$ " outlet jack, making it easy to remove the power pack for storage.

We used an MRC power pack for the layout, mounting it to a small 1 x 4 shelf that plugs into the side of the layout.



TURF, SHRUBS, AND WEEDS

Our base scenery layer on this layout is ground foam turf. To start the ground-cover process, paint the scenery with a thick coat of earth-colored latex paint. (It's a good idea to cover the track and ballast with masking tape before starting this step.) While the paint is wet, sprinkle on various shades of Woodland Scenics fine ground foam. Applying ground foam with a shaker bottle really speeds up the process.

Once the paint dries, you'll see that the initial layer of ground covering looks too smooth and regular. To create scenery with more texture, we added some weeds and shrubs, as shown in **fig. 1**. Use coarser textured ground foam and foam foliage clumps to add shrubs and other small vegetation. You can glue the foam to the layout with white glue, or soak the weeds with rubbing alcohol and cement them in place with Woodland Scenics pre-mixed scenery cement. Allow the weed-grown areas to dry overnight.

ROCKS

We added a few rock outcroppings to provide visual interest to the hillside. The rocks are plaster castings made from Woodland Scenics rock molds. Once the plaster hardens, remove the rock from the mold and cement it to the layout with Liquid Nails for Projects. See **fig. 2**. Blend the casting into the hillside with

Sculptamold, a papier-mâché type product. Once the castings and surrounding Sculptamold are dry, place a few drops of India ink in a spray bottle of water and spray the rock surface, as shown in **fig. 3**. The ink will settle into the crevices, creating a very realistic effect. When the ink dries, you can use paint to add extra color to the rocks.

TREES

Even a small layout like this one would need hundreds of trees to look like Eastern mountains. For background trees we used Woodland Scenics clump foliage to simulate the tops of trees covering our hillside. Working in small sections at a time, start by covering part of the hill with Woodland Scenics Hob-E-Tac cement. See **fig. 4**. Next, stretch the foliage material



apart in your fingers until it just starts to crumble, then apply it directly to the hillside. Don't push the material down – just let it lie naturally. For the foreground trees we used Woodland Scenics tree kits.

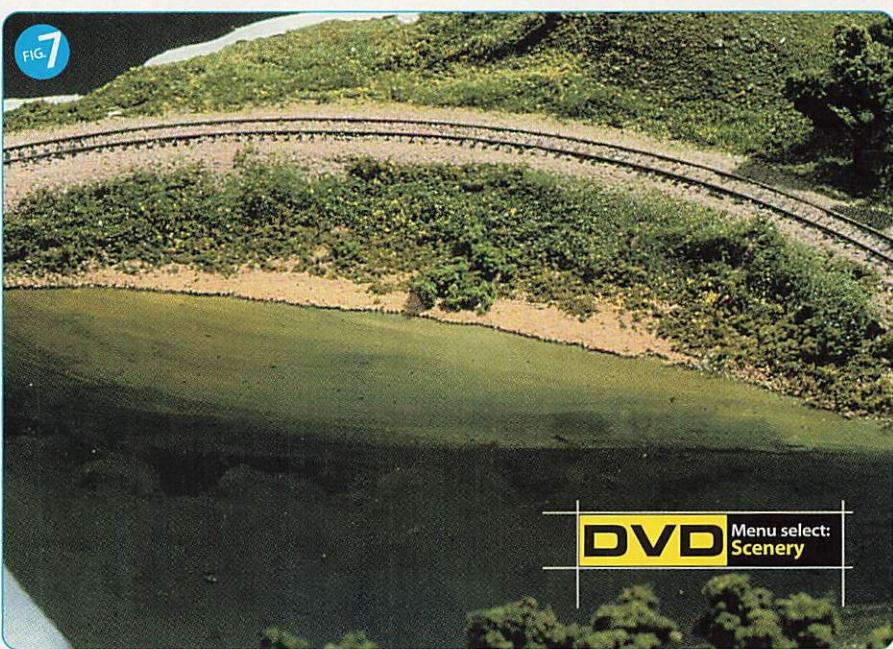
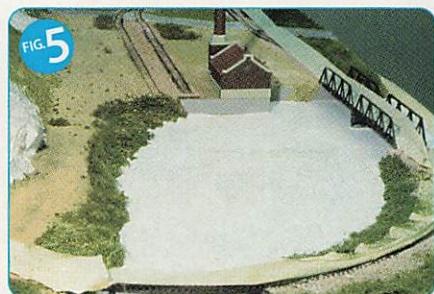
WATER

Once the bridges and surrounding scenery were in place, it was time to start the river – the scenic highlight of the Carolina Central. First, pour a soupy mixture of plaster to form the river, as shown in **fig. 5**.

Make sure to dam the ends with masking tape and work over a water-proof drop cloth. After the plaster sets, paint the deepest areas of the river with flat black latex paint, as shown in **fig. 6**. To represent the shallower areas, feather earth-colored paint from the riverbanks out into the black. See **fig. 7**.

We used Enviro-Tex, a two-part resin material that dries to a glossy surface. (You could also use Woodland Scenics Realistic Water, as a one-part water-based alternative to Enviro-Tex.) Follow the instructions for mixing and applying this material.

The resin creeps up the banks as it cures. This can't be prevented, so after the resin hardens completely, carefully blend the edges of the river and the scenery with ground foam or other texturing materials. We used tan ballast, as shown in **fig. 7**.#



DVD Menu select:
Scenery



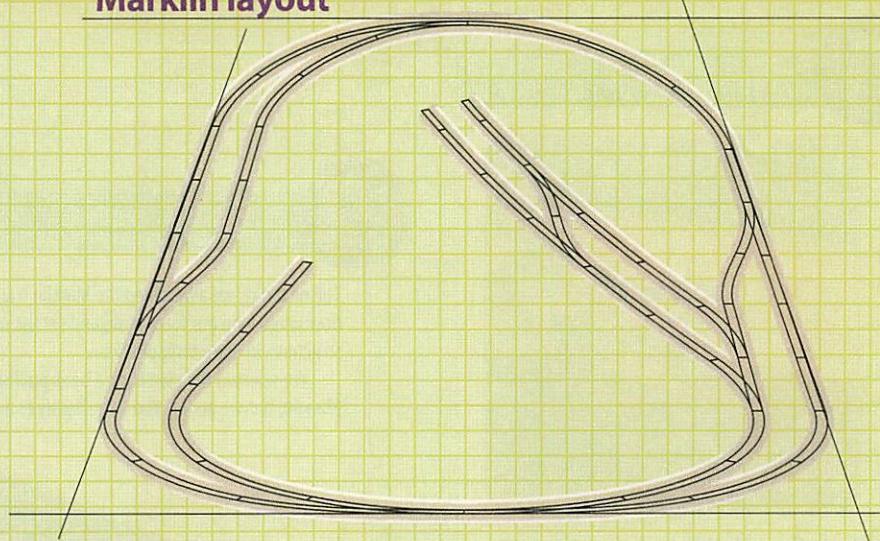
No muss, no fuss – here's a layout you could even build over a carpet. We used grass mats, scissors, tape, and a sheet of extruded foam insulation board to build this German-themed railroad.

Build an **easy layout** with **scissors and tape!**

Taking advantage of sectional track with molded roadbed



Märklin layout



SCALE:
HO

CONTROL:
DIGITAL

SIZE
4'x8'

SETTING:
GERMANY

Here's a layout you can build in a couple of evenings. It's lightweight, requires few tools, and can be constructed with minimal noise and mess.

We chose a German theme for this railroad (you could just as easily use American-prototype models) so we could try a Märklin train set and the firm's type C sectional track that includes roadbed. We also tried various scenery mats and used German-prototype structure kits from Faller, Kibri, and Vollmer.

We built most of these colorful injection-molded plastic kits straight from the box without modification.

The layout's light weight makes it ideal for those who don't have space for a permanent layout. The model railroad can be set on sawhorses or a table during operating sessions. Once the session is complete, the trains and buildings can be removed and the model railroad can be put into storage in a closet or under a bed.

STEP 1

AN EASY FOAM BASE



To create a stable platform, we used two sheets of $1\frac{1}{2}$ "-thick 4 x 8-foot extruded foam insulation board fastened together with strips of 2"-wide double-faced carpet tape. We set one foam sheet on a pair of sawhorses with its printed advertising facing up.

Then we ran tape around the perimeter with additional lengthwise strips spaced across the sheet about a foot apart.

After stripping off the protective paper to expose the tape's adhesive, we turned the second foam sheet so its printed side faced down and pressed the two sheets together. We made sure the foam was aligned perfectly because the tape's adhesive bond is nearly instantaneous.

We used a Stanley Surform plane and sandpaper to smooth all of the foam edges, and then we applied an even coat of brown latex paint to give the foam a more pleasing appearance.

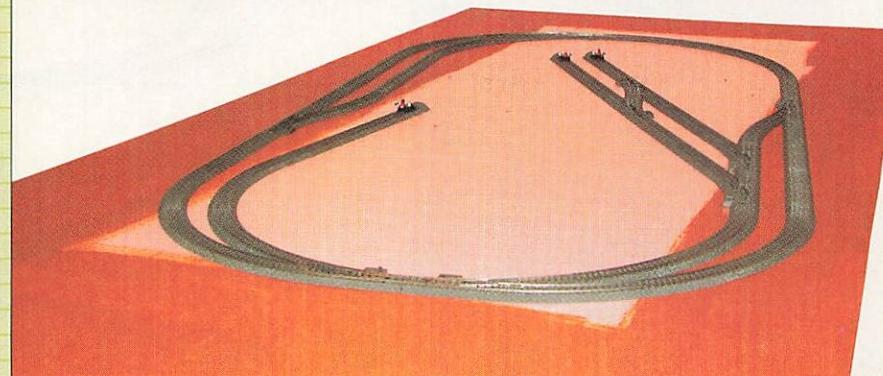
STEP 2

TEST FIT THE TRACK

The next day, we assembled the Märklin track, positioned it on our foam base, and set the major structures in place temporarily.

We selected the plan from a book published by Märklin, but we angled the oval slightly to avoid

having tracks parallel to the edges of the layout. We used a felt-tipped marker to outline the roadways and other areas that were to receive a gravel surface, and then we set the buildings aside so we could install the scenery mats.

**STEP 3**

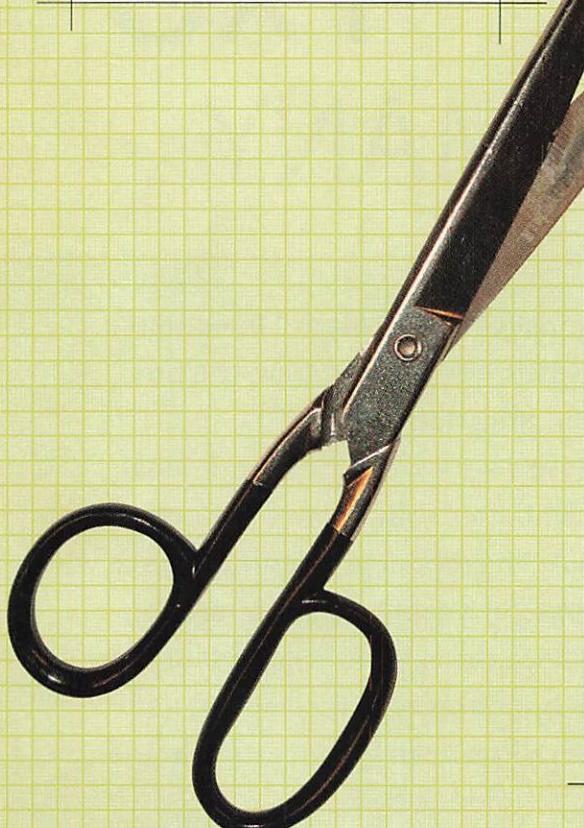
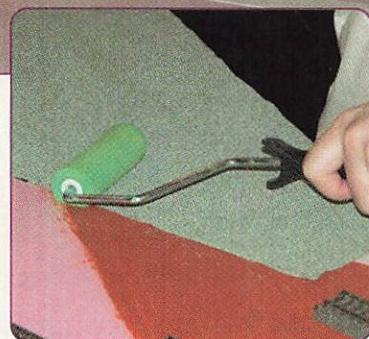
SCENERY WITH SCISSORS



Our flat scenery is made from a variety of grass and other texture mats from Busch, Faller, and Noch. We hid the edges and seams of the thinner mats under the track. The taller field grass mats were thick enough to cause track elevation problems, so we used scissors to cut and fit them around the roadbed.

All of the scenic mats were easy to trim with ordinary scissors. Then we applied strips of carpet tape beneath all the edges and pressed the mats down to secure them. The strip of paper protects the top of the tape during the initial application. Once the paper is removed, the adhesive will secure the mat.

We used a 4" foam paint roller to smooth wrinkles in the mats and used panel nails to pin down any loose edges.



MATERIALS

Marklin type C track

- 24077 $3\frac{1}{64}$ " straight (1)
- 24115 $1\frac{1}{2}$ $14\frac{1}{16}$ " radius (1)
- 24130 $14\frac{1}{16}$ " radius (12)
- 24172 $6\frac{1}{4}$ " straight (8)
- 24188 $7\frac{17}{32}$ " straight (9)
- 24224 $17\frac{1}{4}$ " radius (2)
- 24230 $17\frac{1}{4}$ " radius (3)
- 24611 left turnout (2)
- 24612 right turnout (4)
- 24671 left curved turnout
- 24672 right curved turnout
- 24978 $3\frac{3}{64}$ " bumper (3)

SCENERY

Busch

- 7182 plowed field ground cover
- 7210 light green grass mat
- 7211 spring green grass mat
- 7216 dark green grass mat
- 7221 green mat
- 7292 wild grass mats

Faller

- 130979 knitting mill
- 180778 gray ballast mat
- 180785 dark brown ballast mat

Kibri

8140 house
 8182 house
 8180 house
 8362 two-story houses
 8303 Wallgraben houses
 9302 freight house and office
 9483 Allendorf signal tower
 9529 Blankenberg station
 9772 village church

Noch

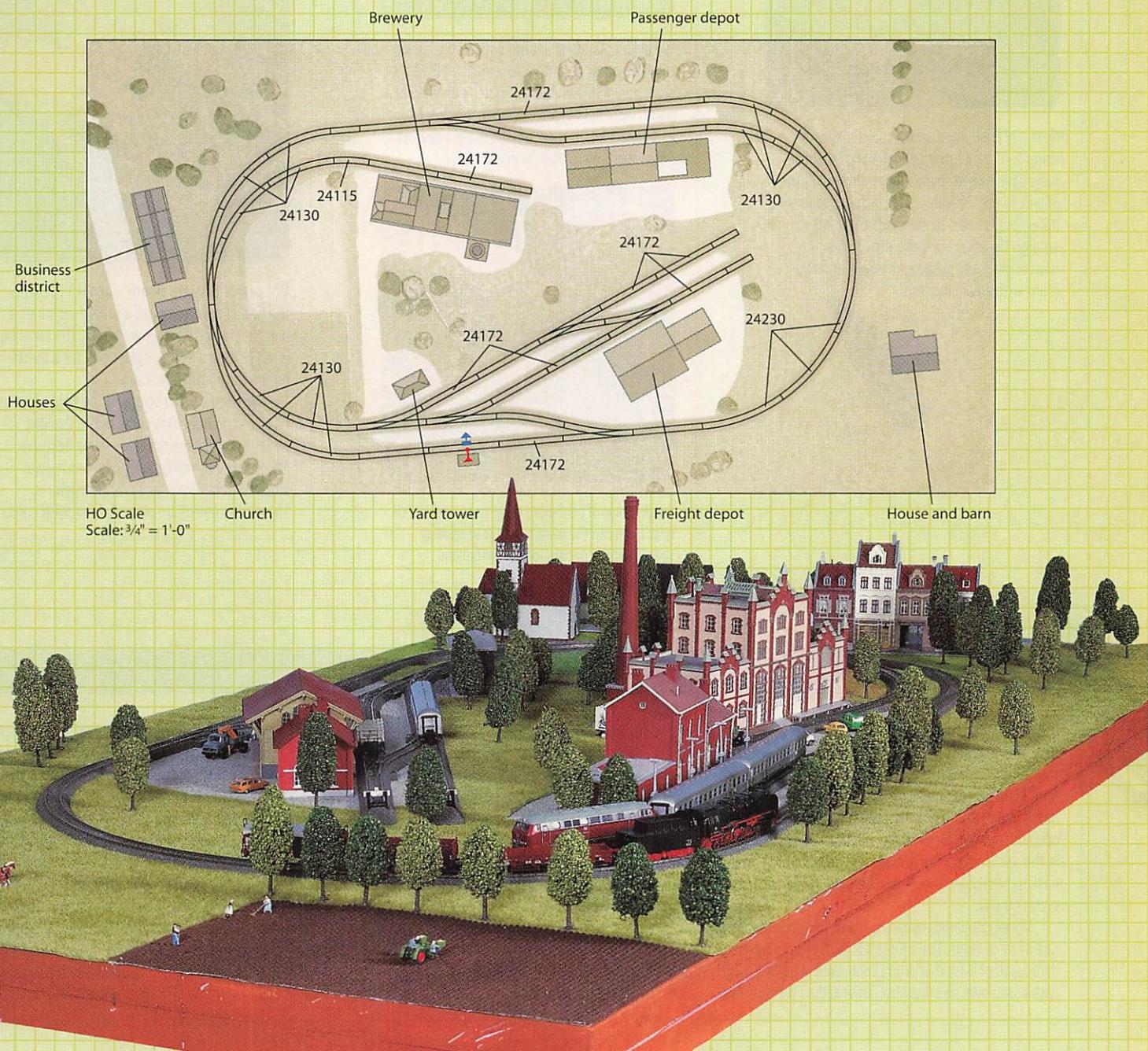
110 spring grass mat
 230 dk. green meadow grass mat

280 summer meadow grass mat
26300 deciduous trees

Vollmer

MISCELLANEOUS

.024" brass wire
1 $\frac{5}{8}$ " paneling nails, black and dark brown
4 x 8 extruded-foam insulation board 1 $\frac{1}{2}$ " thick (2)
double-faced carpet tape



STEP 4

SECURE THE TRACK



Next, we positioned and secured the track using $1\frac{5}{8}$ " dark brown paneling nails. These nails have ribbed shanks that hold well in the plastic foam. Märklin's track includes mounting holes, but we had to use a drill to slightly enlarge them for our nails. Installation is a matter of simply pushing the nails into the foam with any handy tool.

STEP 5

STRUCTURES AND TALL GRASS



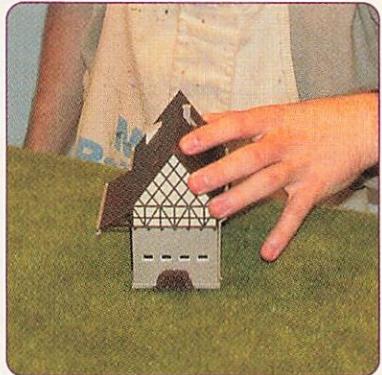
We began placing structures back on the layout, trimming pieces of the various mats to detail the areas around the buildings. These oddly shaped pieces were held in place using more carpet tape and panel nails pushed into the foam. Since our nails were brown, they blended right in.



Small scraps of field grass came in handy to hide gaps between the mats or help camouflage straight edges so they look more natural.

STEP 6

ADD DETAILS



One corner became a farm when we cut away the field grass and added a brown corrugated mat that looks like a plowed field. The building is made from a Vollmer plastic kit for a combination farmhouse and barn.

We used smaller scraps of the field grass to fill gaps and help hide some of the straight edges between the different scenic textures. Most were cut into roughly oval or irregular strips to fit between tracks and structures. These filler pieces are pinned down with nails.

GOING DIGITAL

Once most model railroaders get their train set up and running, the first thing they want is . . . another train. Buying that second locomotive is a simple deal, but things get a little more complicated once you get it home to your layout. If you put both of your locomotives on the track and open the throttle, they will run, but at the same speed and in the same direction. Though you're running two trains, having them play monkey-see monkey-do gets frustrating pretty quickly.

Model railroaders usually get around this problem in one of three ways. The simplest is to have two independent loops of track that aren't connected electrically, and each has its own speed control. This method is better than

just having both locomotives on the same track, but it still isn't exactly how the Norfolk Southern does it, is it?

The next method involves dividing your railroad into several (often many) different electrical sections by using insulated rail joiners. These joiners, which are usually made of plastic, hold the track sections together but don't conduct electricity. You run wires to each isolated section and use a network of slide or toggle switches to choose which power supply sends power to a given section. It works, but the wiring can get pretty complex pretty quickly, and you still end up having to maintain a distance between your trains so that they don't end up in the same electrical section, or block, at the same time.

The simplest, and newest, solution is to use a digital control system. In a digital system, the power supply sends coded signals to the locomotives, allowing you to choose which one (or more) you want to run. You pick "engine 4" and turn up the throttle, and engine 4 goes. Engines 1, 2, and 3 won't respond – it's kind of like the way your garage-door motor responds to only your opener and ignores signal's from your neighbor's opener.

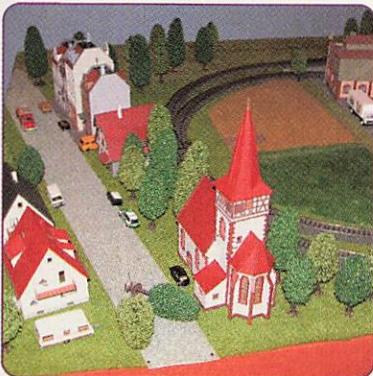
Several manufacturers sell these systems, and locomotives with built-in receivers (usually called "decoders") are available in most scales. In G scale, LGB's MTS system is most common, and in O gauge you'll see both Lionel's TrainMaster system and MTH Electric Trains' DCS system. In

STEP 8

EASY WIRING

STEP 7

INSTALL TREES



To give the layout more visual interest, we added several ready-made deciduous trees from Noch bulk packs. They came with flat-bottom bases, so we modified the trees by drilling a $\frac{1}{16}$ " hole about $\frac{3}{8}$ " up into each trunk. We then cemented brass wire mounting pins into the holes with cyanoacrylate adhesive (CA). All it takes is a gentle push to mount these modified trees, and they can be moved at any time. The pins also keep the trees standing if the layout is bumped.



The train set we chose for this layout (Märklin no. 29821) came complete with Märklin's new digital control system, and the locomotives in the set were already equipped with the electronic circuits (called decoders) that would allow us to control them using the digital system. That meant that all we had to do to wire the layout was to connect the controller (or control station) and the power transformer to the connection box on the track section designed for this purpose.

The cables from the Märklin set include special plugs that make it next to impossible to wire the system incorrectly. While you can control more than one locomotive (10, actually) with this system, it provides enough power to run only three or four at a time, and the controller has only one speed adjustment knob. You can, however, add a second controller (plugged into the same track section) so that two operators can run trains.



HO scale, Märklin sells the system we used for this layout. Several firms, including Atlas, Bachmann, CVP, Digitrax, Lenz, and Model Rectifier Corp., offer systems and locomotives that use a common set of electronic standards, which are called DCC (for Digital Command Control). Each type of digital system works very reliably, but they don't all work together, so you'll want to check with your local hobby shop to see whether the locomotive you're considering will work with the system you've chosen. Some locomotives come with sound and even smoke, and the newest systems have

remote controls that aren't much different from the one you use for your television or home theater.

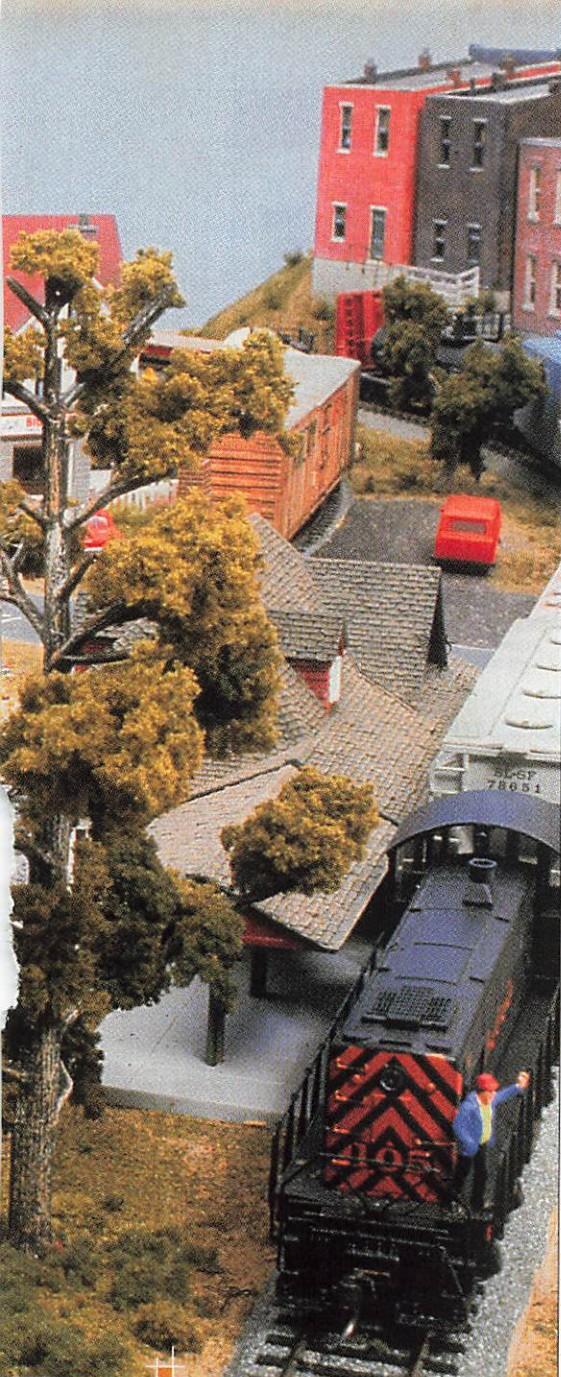
If you really get into digital control, you'll find that these systems are remarkably powerful and flexible. Many of them are capable of controlling dozens of trains at a time plus track switches and other accessories, and most even make provisions for controlling your layout from a personal computer. (Some will even let you control your layout from a Palm Pilot!) But the biggest advantage they offer is that you can run several different trains on the same track at the same time, with only two wires attached to the track. Sounds simple, right? It is. — Terry Thompson, Editor, Model Railroader #



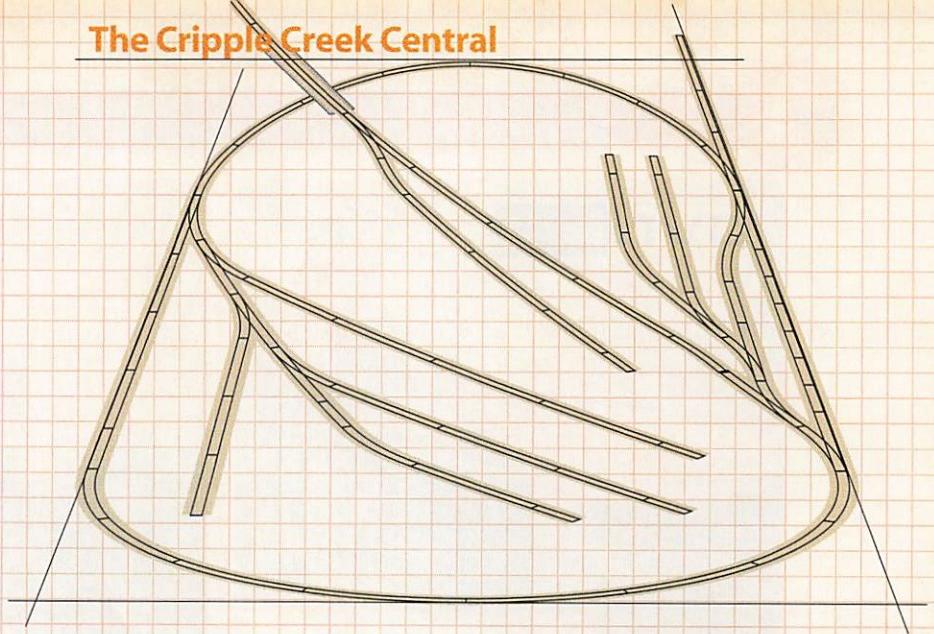
The Cripple Creek Central is a 4 x 8-foot HO scale layout packed with action. At right, a Denver & Rio Grande Western switcher has arrived to start switching cars on the layout's many sidings.

From city to country

A lightweight layout designed to grow



The Cripple Creek Central



SCALE:
HO
CONTROL:
DC POWER PACK
SIZE
4'x8'
SETTING:
MIDWEST UNITED STATES

Ideally, a model railroad should be planned thoroughly before construction starts. It's the best approach, but it's not often the one used. Lots of people start with a train-set loop of track running on the floor, build a table of some sort for it, and then begin adding track, structures, and scenery as the spirit moves them. These are layouts that grow, and that's the approach we took when building the HO scale Cripple Creek Central project layout.

The Cripple Creek was built by *Model Railroader* staff members and other contributors. The construction of the railroad was detailed in a series of articles that ran for 23 months in *MR*.

This layout shows that you can make up a railroad as you go along – and have a lot of fun doing it. The main thing is to get started. Once you begin building, the ideas will come. When they're a little slow arriving, just run the trains and enjoy.

STEP 1**KEEPING ON TRACK**

We built the Cripple Creek Central to have an opportunity to use Kato's Unitrack "all-in-one" (rails, ties, and ballast) sectional track. The original layout featured in *Model Railroader* was unusual because it was a 4½ x 8-foot model railroad. That awkward extra half-foot was for a reason . . . at the time Kato offered only 24"-radius curves, so a loop of track wouldn't fit on a 4 x 8-foot table. Since then Kato introduced 22½"-radius curves, so a loop of track will fit on a 4 x 8-foot surface. We've updated the track plan and materials list to reflect that.

We built this train table using ½"-thick Fome-Cor. We suggest you use the all-plywood train table featured in the benchwork chapter. We then laid sectional track with one turnout and spur (left), and then added different projects each month. We didn't begin gluing the track down until we were almost halfway through the project.

Since we equipped our rolling stock with Kadee couplers, we installed uncoupling magnets between the rails. The magnets pull the couplers to opposite sides and uncouple the freight cars.

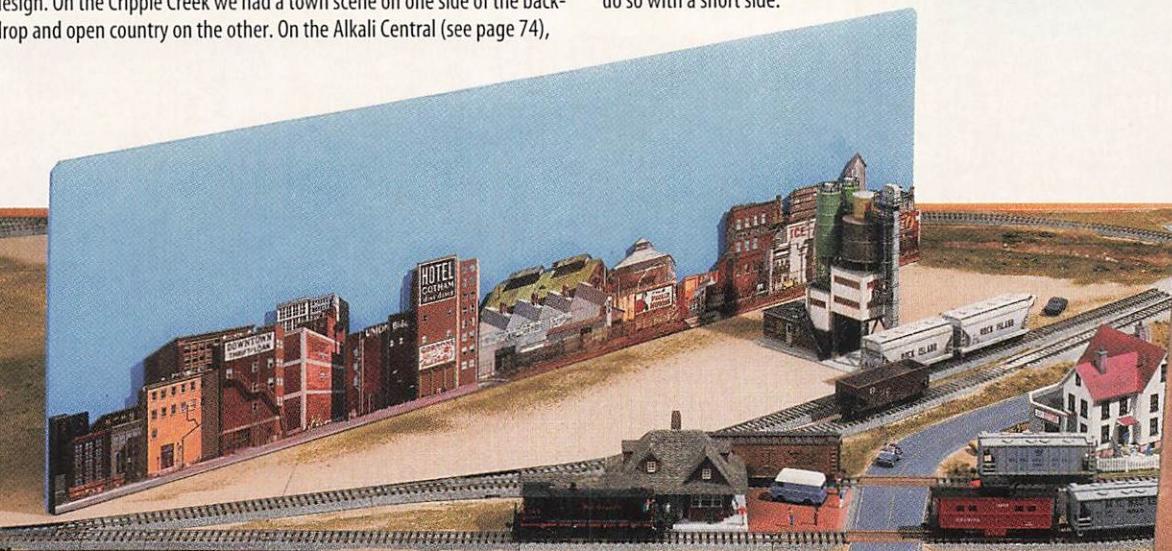
STEP 2**THE BACKDROP**

The feature that we think "makes" the Cripple Creek Central is the 14" x 52¼" scenic divider. We built the divider using ¾"-thick Fome-Cor graphic arts board and ¼"-thick mounting board. Over the years we've built many small layouts with similar dividers and almost always placed them at an angle to the layout's edges. Invariably this made the layouts more interesting and realistic. The "loop look" was broken simply because half of it was always hidden when you viewed the railroad from either side.

Angled scenic dividers also gave us a lot more freedom in scenery design. On the Cripple Creek we had a town scene on one side of the backdrop and open country on the other. On the Alkali Central (see page 74),

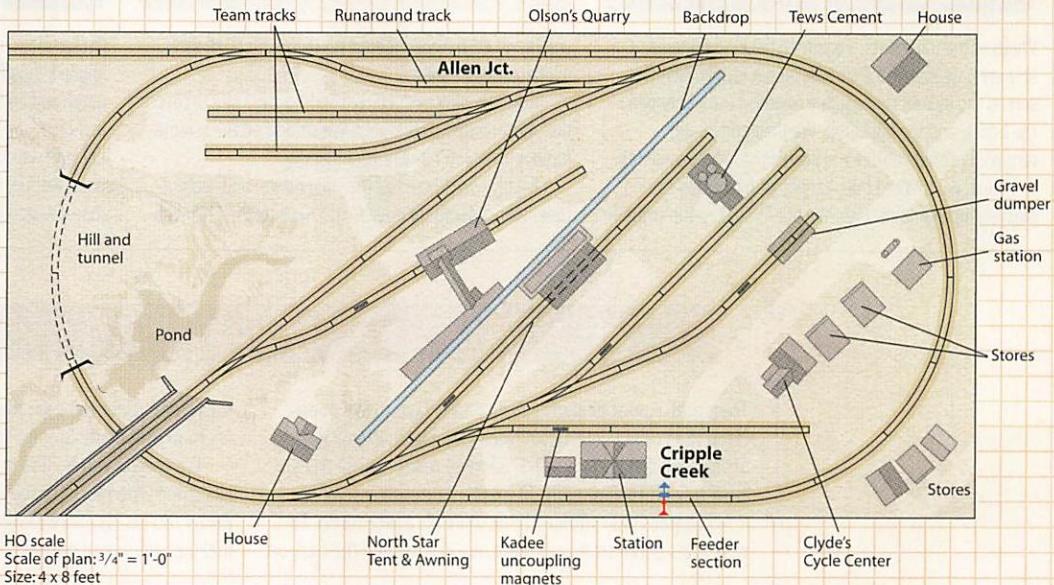
there's a town scene on one side of the divider and a desert scene on the other. There are lots of possibilities: You could model summer on one side of the divider and winter on the other or a mountain scene separated from a seaport or an ocean beach.

The only disadvantage in building a 4 x 8-foot layout with a scenic divider is that you need access to both sides if you're going to switch industries in both your scenes. Generally this means you won't want to place a long side of the layout against a wall, although certainly you can do so with a short side.



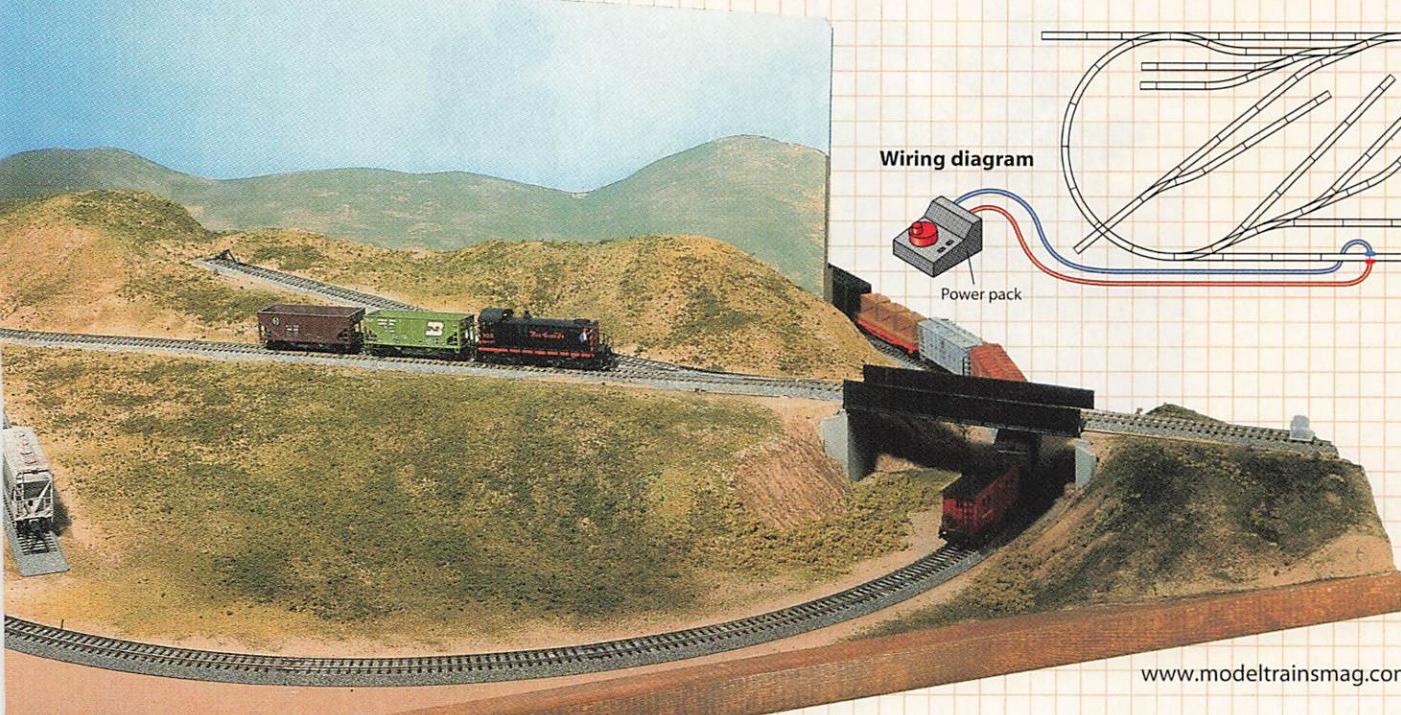
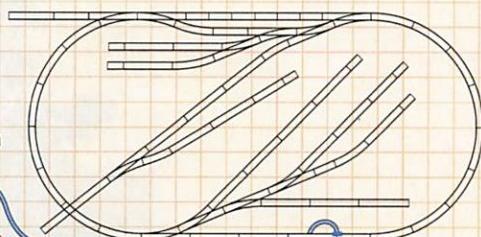
MATERIALS

Amaco 41821 Sculptamold	Faller 193 gravel tipple 130950 cement mix plant	Model Power 455 Burlington Mills factory (2) 488 The Sullivans' House	49 turf, green blend 62 coarse turf, burnt grass 63 coarse turf, light green 65 coarse turf, dark green 125 paint set 223 gas station 1102 and 1103 realistic tree kits 1203 plaster cloth
Atlas Model Railroad Co. 85 plate girder bridge 706 station kit	Kadee Quality Products Co. 321 uncoupling magnets	Pikestuff 5000 small enginehouse	
Color-Rite 805 3½" x 8" rock mold 807 3½" x 4¾" rock mold	Kato U.S.A. Unitrack 2-120 4½" straight track sections (7) 2-130 6⅔" straight track sections (7) 2-150 9¾" straight track sections (20) 2-151 9¾" straight feeder track (1) 2-170 bumpers (7) 2-210 21⅝"-radius curve sections (16) 2-270 22½"-radius curve sections (2) 2-840 manual left-hand turnout (6) 2-841 manual right-hand turnout (5) 2-850 curve from left-hand turnout (2)	Rix 628-201 One-story house 628-203 One-story house w/ side porch	
Con-Cor 6100 ramp/hopper car set		Wm. K. Walthers, Inc. 949-711 Instant Horizons freight yard backdrop 949-712 Instant Horizons hotel and business district backdrop	
Design Preservation Models 101 Kelly's Saloon (2) 108 Goodfellows Hall		Woodland Scenics 44 turf, burnt grass	MISCELLANEOUS ½" x 40" x 60" Fome-Cor (3) ¼" x 30" x 40" mounting board ¹⁵/₁₆" wood angle, 8 feet long (4) paint pan, roller, and paintbrushes 20" x 30" Fome-Cor graphic arts board, ³/₁₆" thick flat black and tan latex paint, 1 quart each semigloss polyurethane varnish, ½ pint yellow carpenter's glue, 1 pint



Wiring diagram

Power pack



STEP 3

ROLLING HILLS

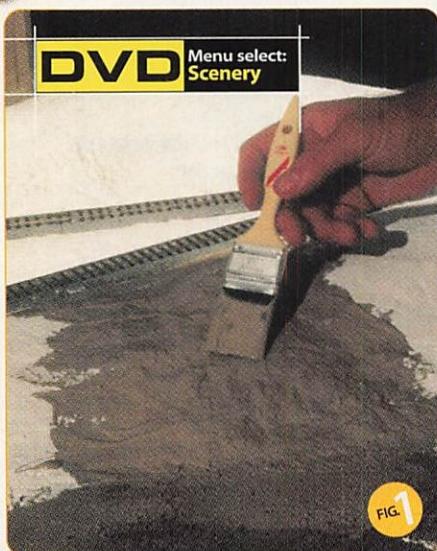


FIG. 1

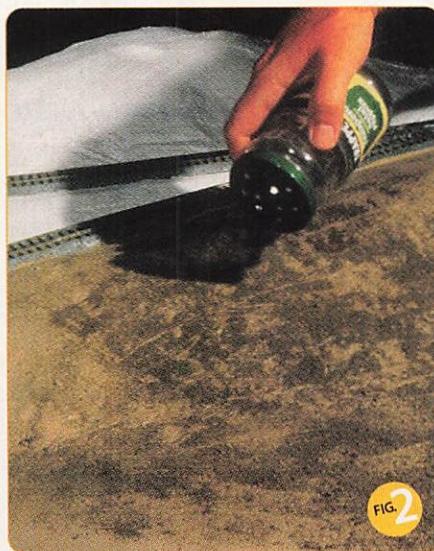


FIG. 2

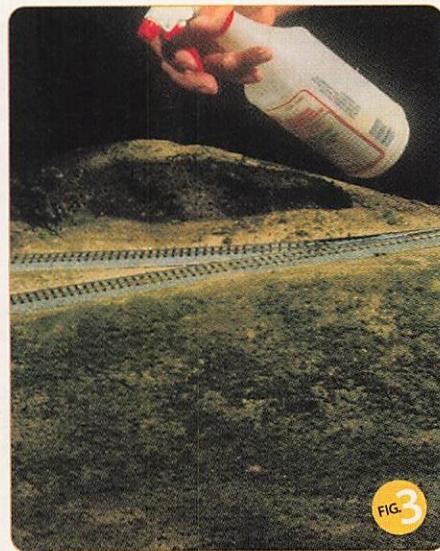


FIG. 3

We used foam peanuts, a common packing material, as a scenery base for the rolling hills on our layout. First we spread the peanuts around the elevated track between the bridge and the backdrop. We then added and removed peanuts until we achieved the look we wanted.

Next, we covered the peanuts with 6" strips of plaster-impregnated cloth. We briefly soaked the strips in

water and then placed them over the peanuts, slightly overlapping the pieces.

After the plaster dried we used a putty knife to cover the plaster with Sculptamold. We smoothed the Sculptamold with a water-soaked paintbrush.

Finally, we cleaned up the stray plaster and Sculptamold with a damp sponge. We then painted the hill with

flat tan latex paint (**fig. 1**). With the paint still wet, we applied various colors of ground foam, including blended green and burnt grass turf and dark and light green coarse turf (**fig. 2**). We didn't cover the paint completely because we wanted some ground color to show. After the paint was dry we sprayed the scenicked areas with a 3:1 mix of water and yellow glue (**fig. 3**).

STEP 4

TREES A PLENTY

Trees add a great deal of realism to any layout. We populated the Cripple Creek with trees made from Woodland Scenics kits (the firm also has a line of ready-to-use trees). Each tree kit took roughly 10 to 30 minutes to assemble.

The trees have molded bark, which is a nice touch. To make this detail stand out more, we drybrushed the bark on

the foreground trees near the edges of the layout with colors from Woodland Scenics' paint set.

We used Walthers Goo to attach the foliage. The tree kits come with more foliage than you'll need, but don't throw the excess away. Leftover foliage can be used for making weeds and bushes.



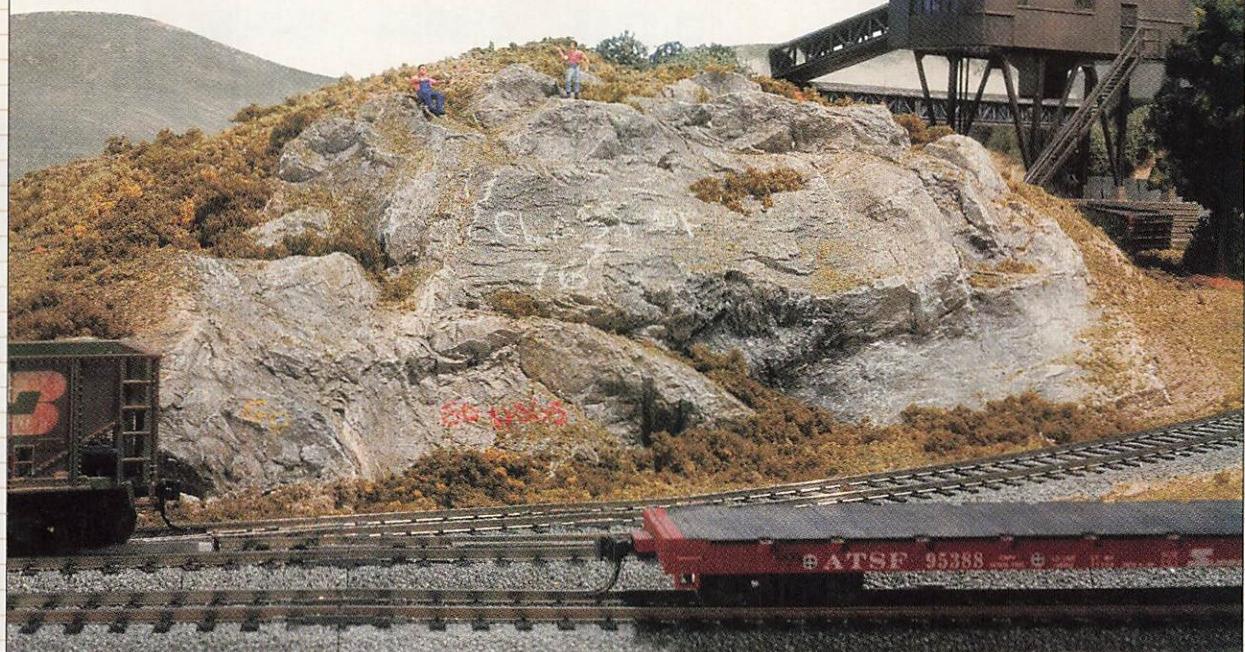
STEP 5**ROCK OUTCROPPINGS**

To add some interest to the rural portion of the Cripple Creek Central, we put rock outcroppings on the hills. We cast the plaster rocks in molds produced by Color-Rite.

We began by pouring plaster into the molds. Once the plaster began to set we carefully placed the molds on the side of the hill, pressing them into the scenery until a small amount of plaster

squeezed out from under the edges. After the plaster was set (but not totally dry) we carefully removed the molds.

With the plaster still wet we stained and painted the rock outcroppings. We first sprayed the castings with diluted India ink and followed that up with a coat of diluted tan paint. It took us only five minutes to add a great deal of realism to our rocks.

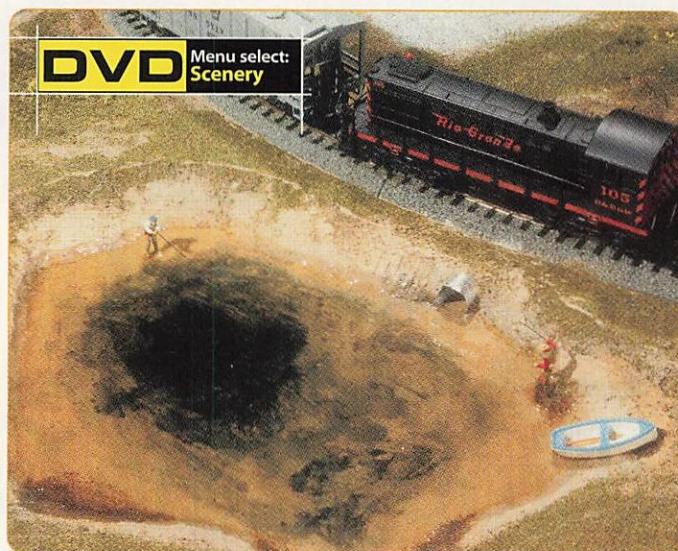
**STEP 6****WATER FEATURES**

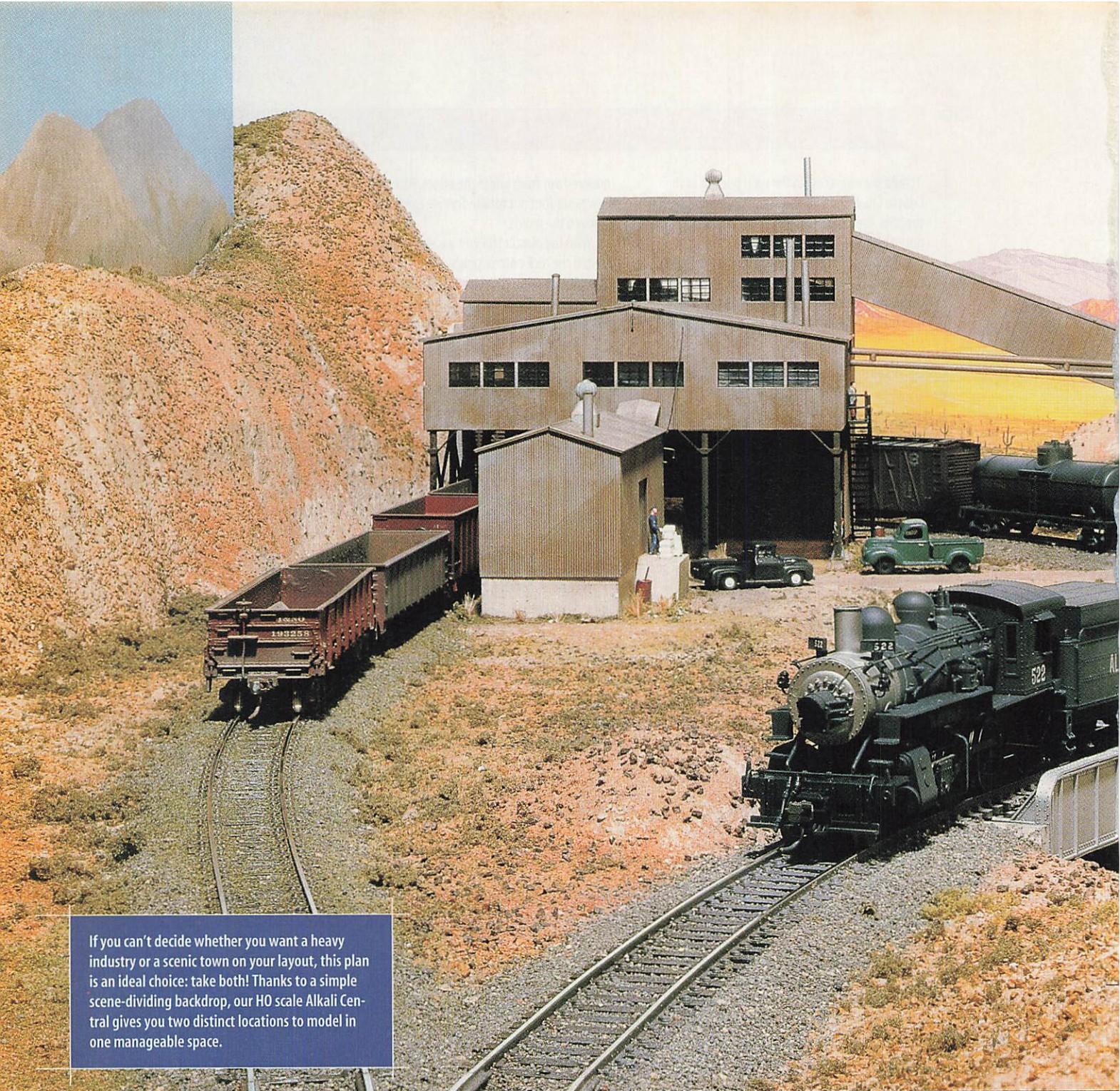
Okay, we didn't add real water to the layout. Instead, we wanted to give the illusion of water. To do this we drew a template of what we wanted the lake to look like. Then we placed the template on the layout and cut through it (and the $\frac{1}{2}$ "-thick Fome-Cor) with a hobby knife. Once the edge of the lake was defined, we used the knife to shape the banks to a 45-degree angle.

Then we cut a piece of Fome-Cor graphic arts board to serve as the base of the lake and glued it under the opening with yellow carpenter's glue. We spread Sculptamold along the edges of the lake to add some texture to our body of water.

After the Sculptamold dried we painted the lake with flat tan latex paint. To give the illusion of depth we feathered in some flat black paint in the center of the lake (you don't want it to look like a black dot).

To add water to our lake we poured in a thin coat of satin varnish, and used a small brush to coax it into the hard-to-reach areas. Other water techniques can be found in the scenery chapter, starting on page 34. #

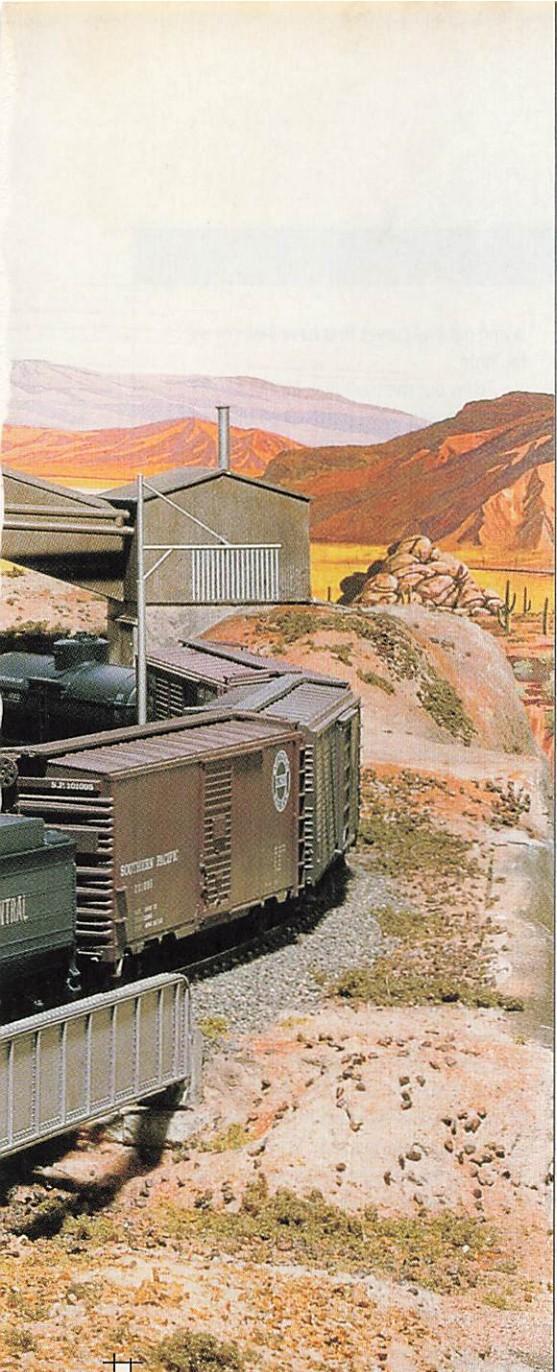




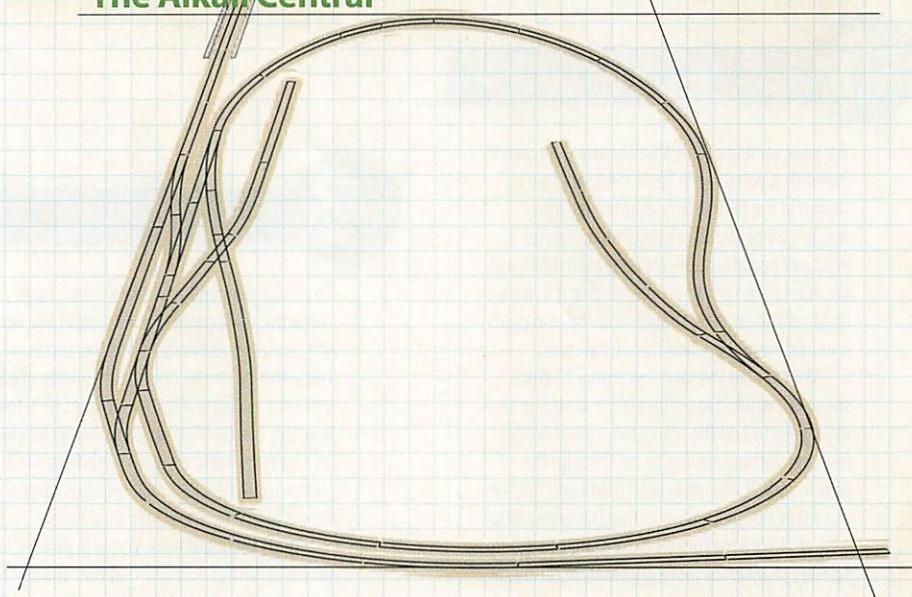
If you can't decide whether you want a heavy industry or a scenic town on your layout, this plan is an ideal choice: take both! Thanks to a simple scene-dividing backdrop, our HO scale Alkali Central gives you two distinct locations to model in one manageable space.

Flextrack through the desert

Taking advantage of both sectional and flexible track



The Alkali Central



SCALE:
HO
CONTROL:
DC POWER PACK
SIZE
4'x8'
SETTING:
SOUTHERN CALIFORNIA

Like the Cripple Creek Central, introduced on page 68, the Alkali Central is another HO scale 4 x 8-foot model railroad with a backdrop drop. This time we ran the backdrop diagonally down the middle of the layout, creating long, dramatically different scenes on each side. The town side represents Alkali Junction, a foothills community enjoying the prosperity of the 1950s in Southern California. Many of the town's citizens work at the Curren Phosphate Mine out

in the desert on the other side of the layout. Alkali Junction is served by the Southern Pacific, which interchanges cars with our shortline railroad, the Alkali Central. The small railroad is owned by the mining company and runs a steam locomotive it bought used from the SP. Though only a few feet, the run around the end of the backdrop in our scheme of things is 23 miles. You can simulate the distance by running a number of laps before arriving at the mine.

STEP 1**LET'S START BUILDING**

For your version of the Alkali Central, we recommend that you use the basic Hediger table shown in the benchwork chapter. Its light-weight, all-plywood construction produces a rigid, yet portable table for your model railroad. We stained the wood on ours to give it a more-finished appearance, though you can also paint it or just leave the wood its natural color.

We covered the tabletop with a 2"-thick sheet of extruded foam insulation board, making it easy to add the plan's two corner water features without having to cut through the benchwork. If you wish, you could keep the layout really simple by eliminating the water altogether. Before making that decision, see the scenery chapter for more information on creating realistic water.

The rest of the scenic features on the layout, including the highway that rises up and crosses the track at one end, will be fairly easy to construct with more foam. To cement the layers of foam together, use a latex-based adhesive, such as Liquid Nails for Projects.



Photos by William Zuback • Illustrations by Rick Johnson

STEP 2**LIFT-OFF BACKDROP**

Building the backdrop was simple – we just went out and bought a prefab interior door. Doors are typically 80" tall, so the one we found fit on the layout just right. Make sure if you do the same, you choose one with a smooth birch skin; it'll be easy to paint without the grain showing through. Prime the door, sand it smooth, then coat it with a flat blue latex paint.

There are several good reasons to make a backdrop removable. For one, it's easier to paint scenery or cement paper buildings to the backdrop if it's off the layout. To attach the backdrop to the layout, make a notch in the 2" foam base, then bolt 3" metal angles to the plywood base to serve as clips to hold the backdrop in place.

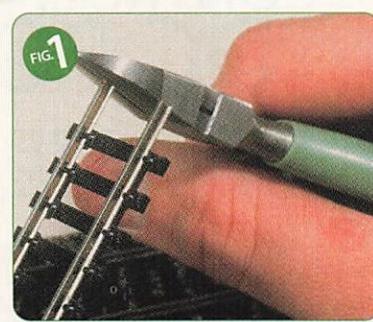
STEP 3**LAYING OUT TRACK**

The track plan and materials list on page 77 show the track pieces used to build the layout. We chose a combination of Atlas sectional track and flextrack, taking advantage of each system's benefits. Flextrack comes in 3-foot lengths, can be bent any which way you want, and lets you build a layout with fewer rail joints. However, flextrack requires careful cutting and fitting, especially on curves.

With sectional track you just shove the pieces together and you're done. Though the geometry of sectional track may be restrictive, it does make it difficult to make mistakes, like

laying out bad curves that have kinks or are too tight.

To lay out the track plan for the Alkali Central on your table, purchase all the track components and start putting them together. Note that half the sections on the end curves are 18" radius and the other half are 22". The core of the railroad is all sectional track, so lay that out first. Use a track nail here and there driven only halfway down to keep the track from sliding around. Once you've laid out the sectional track, it's an easy matter to fill in the gaps with the flextrack.

STEP 4**WORKING WITH FLEXTRACK**

The steps involved in cutting and fitting flextrack are easy, but it's important to work carefully. The best tool for cutting the track is a pair of rail nippers, as shown in **fig. 1**. They are available at most hobby shops.

Start by slipping one end of the track into the rail joiners for the section it'll connect to, then bend the section where you want it to go. Before cutting, check to make sure one of the rails hasn't slipped out of the rail joint. If it has, grip the offending rail with needlenose pliers and shove it back into position. (There have been times when I thought I'd done a perfect job of tracklaying, only to look several sections back and discover a $\frac{1}{2}$ " gap between rail ends!)

Use a hobby knife with a dull blade to mark the cut locations, then use the nippers to make the initial cut. I make mine $\frac{1}{4}$ " or so long and trim back carefully with the nippers to get a good fit. Make sure you wear eye protection – those little pieces of rail can fly around with amazing velocity. If my cut is close but still not quite there, I'll trim the rest of the way with a flat file.

Don't force the rails to fit. If a joiner doesn't slide on easily, dress the rail end with a file, as shown in **fig. 2**. You should leave a slight gap between rail ends to allow for expansion. I like to place snippets of .020" styrene between the rail ends as an expansion gap spacer, pulling the styrene out when I'm finished.



MATERIALS

Atlas code 100 track

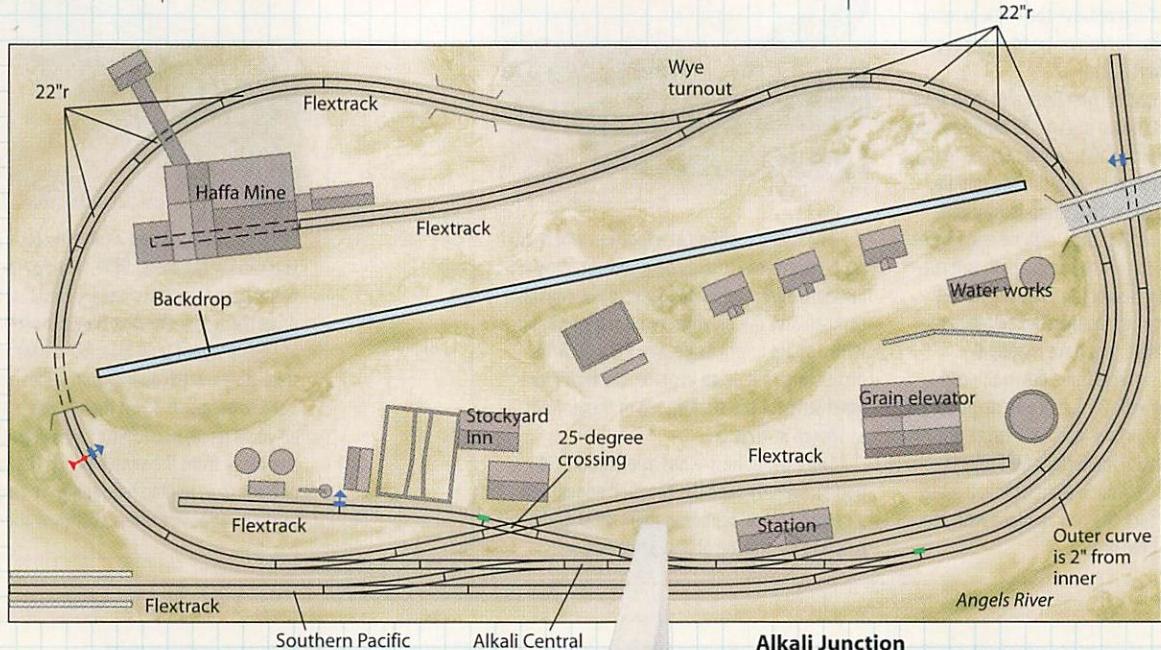
55 insulating plastic rail joiners
168 flextrack (7)
170 rail joiners
172 Custom-Line 25-degree crossing
280 Custom-Line wye turnout
281 Custom-Line no. 4 left-hand turnouts (3)
282 Custom-Line no. 4 right-hand turnouts (2)

821 9" straight (2)

825 1½" straight (2)
833 18"-radius curves (6)
836 22"-radius curves (8)
842 terminal rail joiners

Midwest Products

cork roadbed, 3-foot strips (14)



HO scale (1:87)

Scale: ¾" = 1'-0"

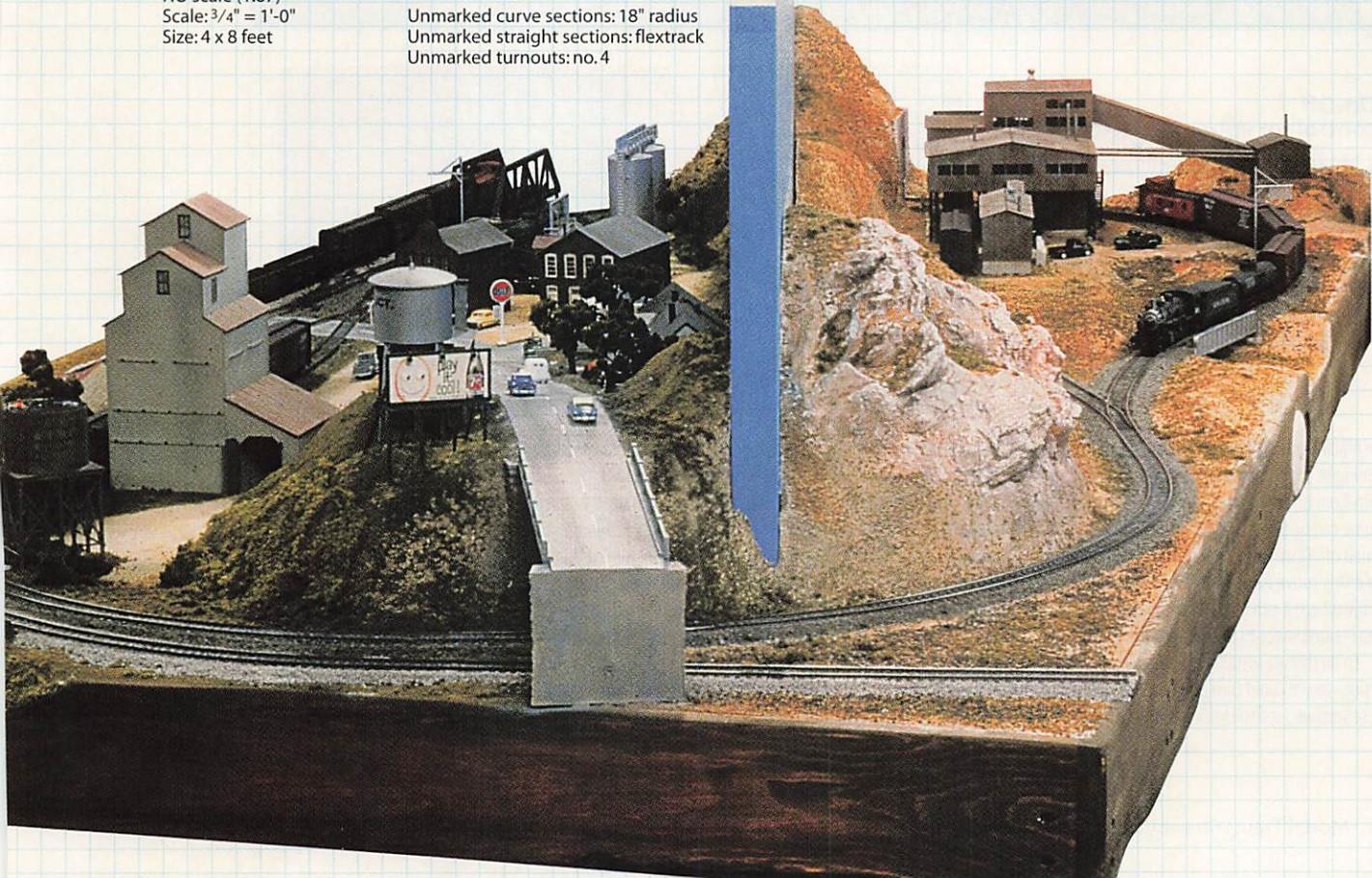
Size: 4 x 8 feet

Unmarked curve sections: 18" radius

Unmarked straight sections: flextrack

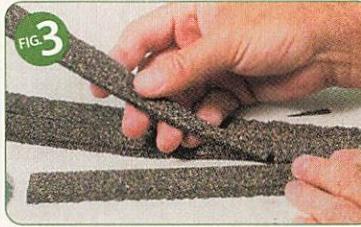
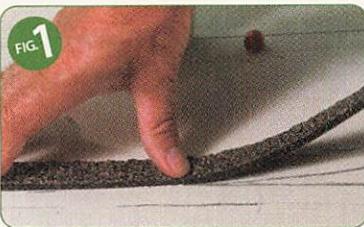
Unmarked turnouts: no. 4

Alkali Junction



STEP 5

ROADBED



Once the track is laid out, trace its outlines with a pencil, then remove the track in manageable chunks. There's no need to take it completely apart again.

Mark the track center lines and then start laying cork, as shown in **fig. 1**. Note that the cork comes in straight-sided sections and is cut partially through at an angle in the middle. Complete this cut with a sharp hobby knife, making two narrow strips with beveled edges. (It's tempting to tear the strip apart, but cutting will yield a neater job.) Lay the halves back together with the beveled edges to the outside, and voila, you have roadbed!

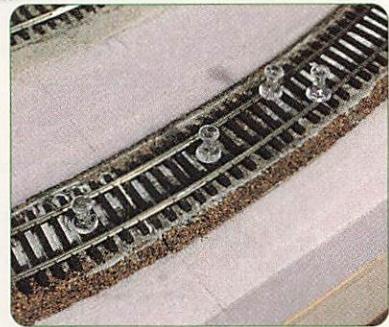
On wood surfaces, glue down the cork using white or yellow glue. If you're gluing the cork to a foam surface, use a construction adhesive, such as Liquid Nails for Projects or PL300 (made by Ohio Sealants, Inc.). In both cases you can tack the cork in place with map pins until the glue dries.

For laying roadbed at a location where two tracks converge, such as a turnout, start by laying both outer cork strips. Next, place the inner cork strip for the diverging route, trimming it with a sharp hobby knife. See **fig. 2**. After cementing that piece in place, cut and fit the inner strip for the straight leg of the turnout, as shown in **fig. 3**.

Once the adhesive has dried (about 24 hours), I gently sand the roadbed edges with a sanding block, rounding them off slightly. It will make the job of ballasting easier.

STEP 7

LAYING TRACK

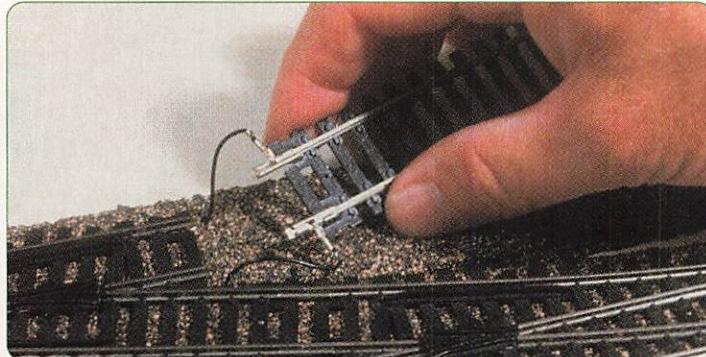
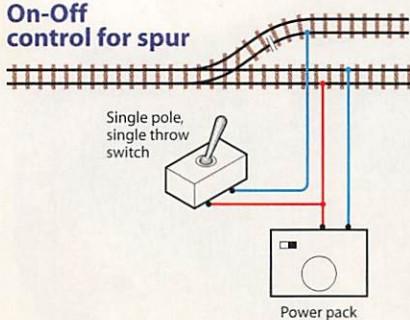


With the roadbed and wiring in place, at last you can lay the track. When laying track on a wood base I use track nails, being careful not to drive them in so far that they distort the ties.

For a layout built on a foam base, glue the track down with construction adhesive. A tiny bead of adhesive down the middle of the track is all you'll need, making sure you keep the adhesive away from the switch points. Use map pins or track nails to help hold things in alignment until the adhesive dries, as shown above.

STEP 6

ON-OFF SECTIONS

On-Off control for spur

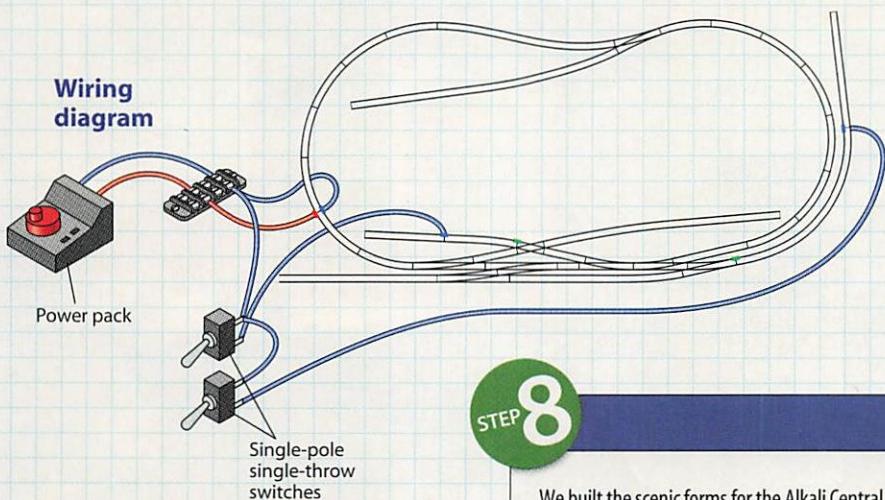
The Alkali Central is designed to be a two-train layout, but not with both running at the same time. For example let's say the SP train is coming into town from under the highway bridge to switch cars. The Alkali Central engine can be parked on the oil tank track with the power to that section turned off. Once the SP engine has dropped off its cars for interchange, it can either move forward to the river bridge or slip back under the highway bridge where it can be parked and that track section turned off. You can then return power to the oil track and run the AC steamer.

To do this we installed toggle switches (as shown above) on two track sections so we could turn power to them on and off. For placement of these sections, see the wiring diagram on the top of page 79.

It's a good idea to plan on-off sections from the get-go because they need to be electrically isolated. The easiest way to do that is with plastic insulating rail joiners. You need isolate only one rail, then use a single-pole, single-throw (SPST) toggle switch to turn the track section on and off, as shown in the illustration. Mount the toggles on the layout edge somewhere near the track they control.

At this point, you should also add feeder wires. For power to the layout you need only one set, and the wires can go anywhere except to an on-off track. We used a pair of Atlas feeders, as shown in the photo above. These are a pair of rail joiners with wires soldered to them. You'll also need to add one feeder wire to each rail you've isolated in your on-off sections.

Wiring diagram



STEP 8

We built the scenic forms for the Alkali Central using the cardboard strip method spelled out in the scenery chapter. However, if you're using the Hediger foam-top table, I'd recommend building the hills with foam.

Obviously you want a parched look on the desert side of the layout and green grass on the other. In both cases I used the techniques described in the scenery chapter. On the desert

LOOKING AHEAD

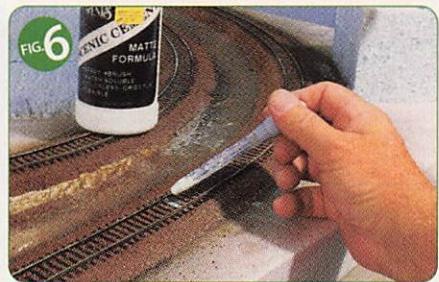
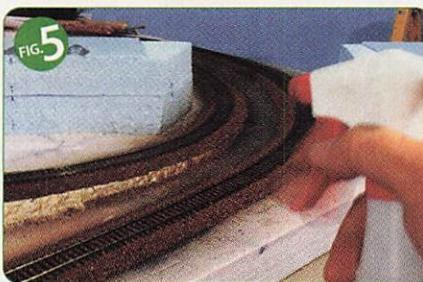
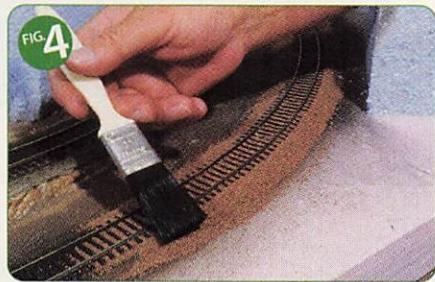
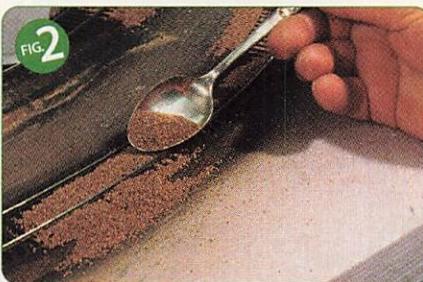
Once you've honed your layout-building skills on this 4 x 8 railroad, you'll be ready to tackle a bigger project. If you haven't noticed already, the SP's main line departs the layout at two corners, making the Alkali Central a good candidate for expanding your model railroading horizons.

SCENERY

side I used Highball Earth and various other sands and dirts available at the hobby shop. You could also use sifted dirt you've taken from your backyard or anywhere else. (On my own N scale Tehachapi layout, I like to add a pinch of "sacred soil," real dirt I brought home from Tehachapi Loop in a film canister.)

For the greener scenery on the town side we sprinkled on ground foam.

STEP 9



To finish the track begin by painting it, using either spray cans or an airbrush. You'll need to clean the tops of the rails as soon as the paint has set (before it cures). Make one pass with a putty knife to get most of the paint off, then finish with a Bright Boy abrasive cleaning block.

For ballast, we used Highball's gray on the Southern Pacific and cinders on the Alkali Central to visually reinforce the concept that these are two separate railroads, as shown in **fig. 1**. [The photos of the ballasting pro-

cedure, though figs. 2 through 6, were taken on a different project railroad, explaining the change in color. — Ed.]

Start by carefully pouring ballast down the middle of the track and along the sides, as shown in **fig. 2**. Keep the ballast well away from switch points. Gently spread the ballast with a paintbrush until it's evenly distributed. I use a $\frac{1}{2}$ " flat brush, and it works well for most all scales. See **figs. 3 and 4**. Take your time when ballasting track, and you'll get good results.

To cement the ballast in place, spray it with rubbing alcohol, as shown in **fig. 5**. Because of its low surface tension, alcohol soaks easily into the ballast, and the adhesive you apply will follow right in after it, forming an even bond. We used Scenic Cement from Woodland Scenics (see **fig. 6**), keeping it away from switch points.

Don't be afraid to use plenty of adhesive. You know you've used enough glue when you see it begin to seep from under the outside of the ballast. #



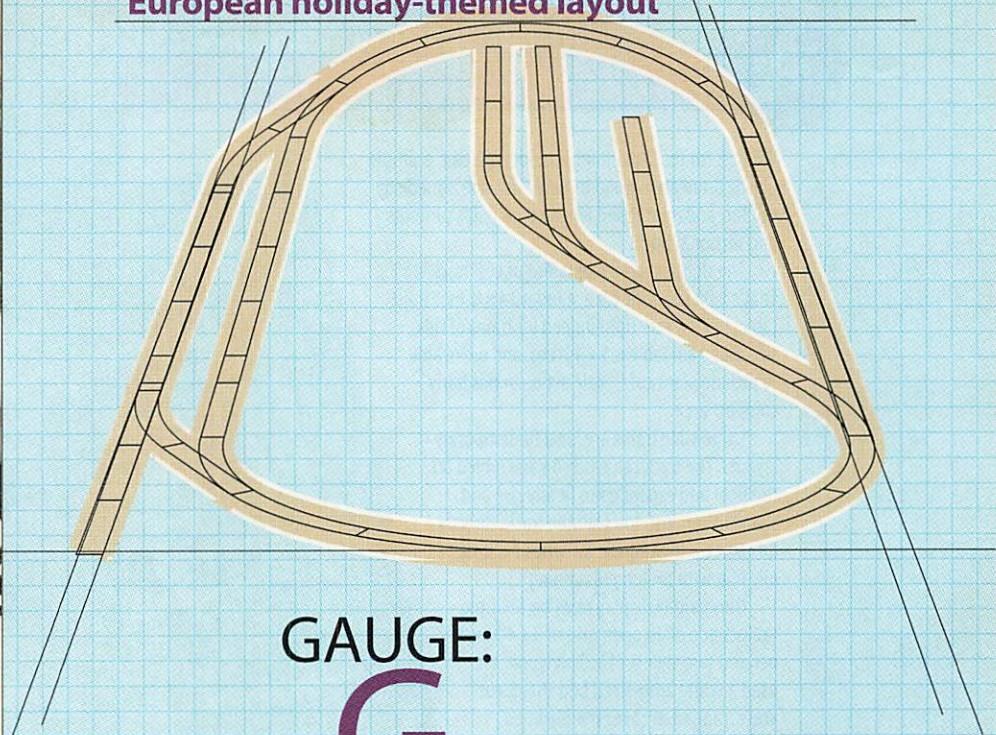
For many model railroaders, a train set up during the holidays was their introduction to the hobby. We kept that idea in mind when we built this 5 x 10-foot European-themed G scale winter layout.

G scale winter wonderland

A trip to the fabric store provides easy and fast snow



European holiday-themed layout



GAUGE:
G
CONTROL:
DC POWER PACK
SIZE:
5'x10'
SETTING:
EUROPE: 1968

Large scale – also called “G scale” – trains are so big that you need two hands to carry them and so rugged that you can run them outdoors (just

Lbe sure to keep devices using house current, including power packs, indoors). The largest of the commonly seen model railroad scales, G scale was developed by German toymaker Ernst Paul Lehmann Patentwerk in 1968 when it introduced its LGB line. (The initials “LGB” stand for Lehmann Gross Bahn, which translates as “Lehmann’s Big Train.”)

Several other manufacturers have joined LGB in making large scale equipment, including Aristo-Craft, Bachmann, Hartland, Märklin, MTH, and USA Trains, and most can be used both indoors and out.

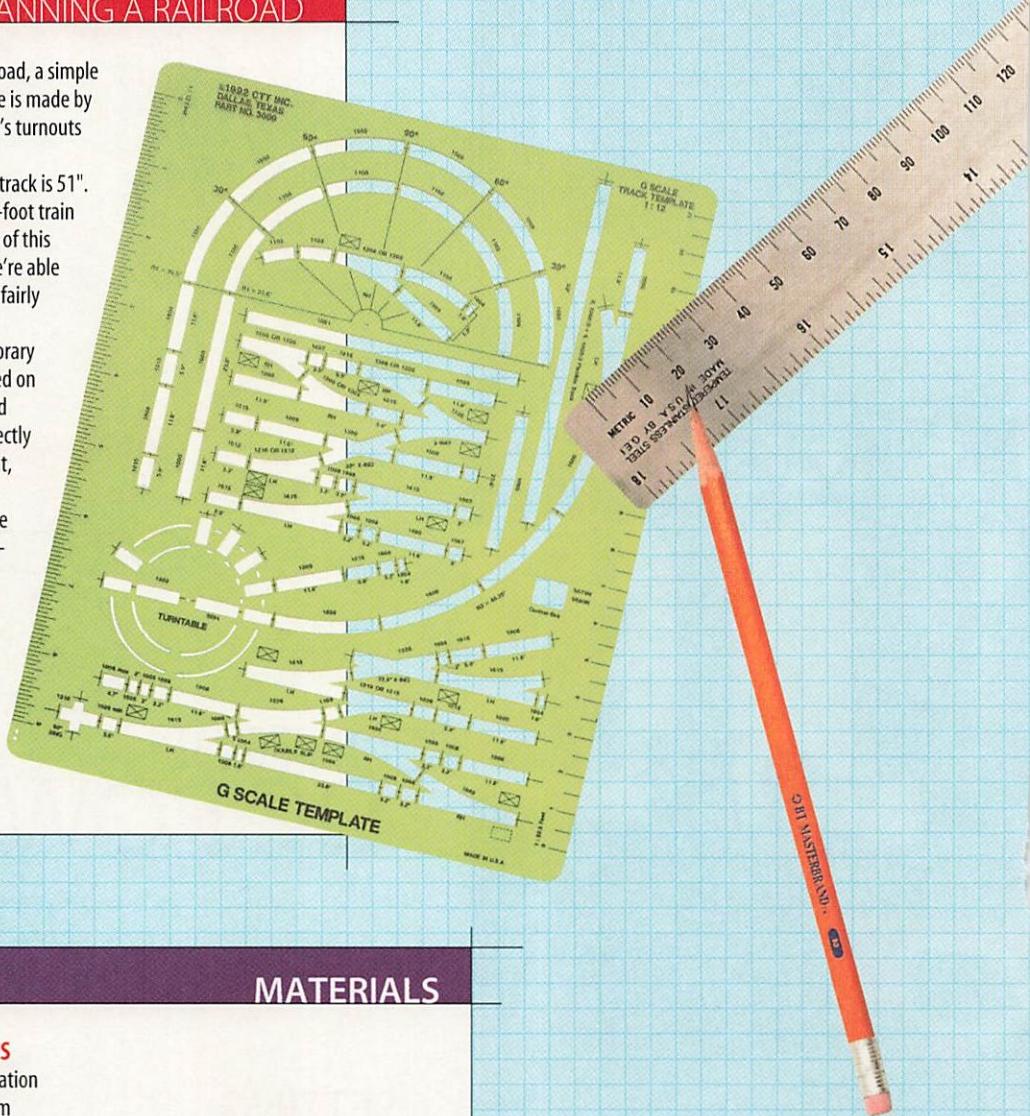
In a nod to G scale’s German roots, we built this 5 x 10-foot European-themed holiday train layout using LGB track and trains and German-style G scale buildings by Pola. Though this is a temporary holiday display, there’s no reason why you couldn’t build it as a permanent layout.

When it comes to planning a model railroad, a simple plastic template is good to have. This one is made by CTT Inc. and is intended for use with LGB's turnouts and sectional track.

The tightest-available radius of LGB track is 51". That's a bit too wide for a standard 4 x 8-foot train table, but it's very tight indeed for trains of this size. Our train table is 5 x 10 feet, and we're able to include plenty of G scale action in this fairly compact area.

Large scale trains are ideal for temporary layouts. The track can easily be assembled on the floor and expanded to fit any size and shape room. Just don't set the tracks directly on carpet — the trains may deposit a faint, oily film with prolonged running.

Our holiday display rests on a simple table made of an open grid of 1 x 4 lumber and two sheets of $\frac{1}{2}$ " plywood. We used a white king-sized bed sheet, cut and arranged to cover the plywood and provide a snowy base for our winter scene. This is a good approach for a layout built on a floor. If you use a train table, it would probably be easier to simply apply a coat of white paint.



MATERIALS

LGB TRACK PIECES

- 10000 straight (23)
- 10040 filler section (3)
- 10150 short straight (5)
- 10310 track bumper (3)
- 11000 curve (12)
- 12000 right-hand turnout (3)
- 12100 left-hand turnout (3)

LGB ELECTRICAL CONTROLS

- 10260 Insulated rail joiners
- 50081 power pack
- 51800 control box

LIFE-LIKE

- 1003 4" evergreens
- 1022 3" evergreens
- 1920 G scale tree assortment

POLA STRUCTURES

- 901 Schönweiler station
- 904 station platform
- 908 covered platform
- 910 locomotive shed
- 914 switch tower
- 920 coaling depot
- 923 watercrane
- 930 house
- 954 fence

WOODLAND SCENICS

- 76 cinders

SCENERY SUPPLIES

- 110" x 110" white polyester quilter's batting (1)
- king-size flat sheet, white (1)

MISCELLANEOUS SUPPLIES

- Duco Stik-Tak

SECTIONAL TRACK SUPPLIERS

ARISTO-CRAFT

Brass or stainless-steel code* 332 rail, European style, 11 ties per foot

Brass or stainless-steel code 332 rail, USA style, 14 ties per foot

BACHMANN

Code 350 tubular steel with black ties

H&R TRAINS/A2 LINE

Stainless-steel code 332 rail, with brown ties

LGB

Code 332 brass rail with brown ties

MICRO ENGINEERING

Code 250 aluminum or nickel-silver rail

Code 332 aluminum rail with brown Delrin ties

PECO

Nickel-silver codes 200 or 250 rail with brown ties

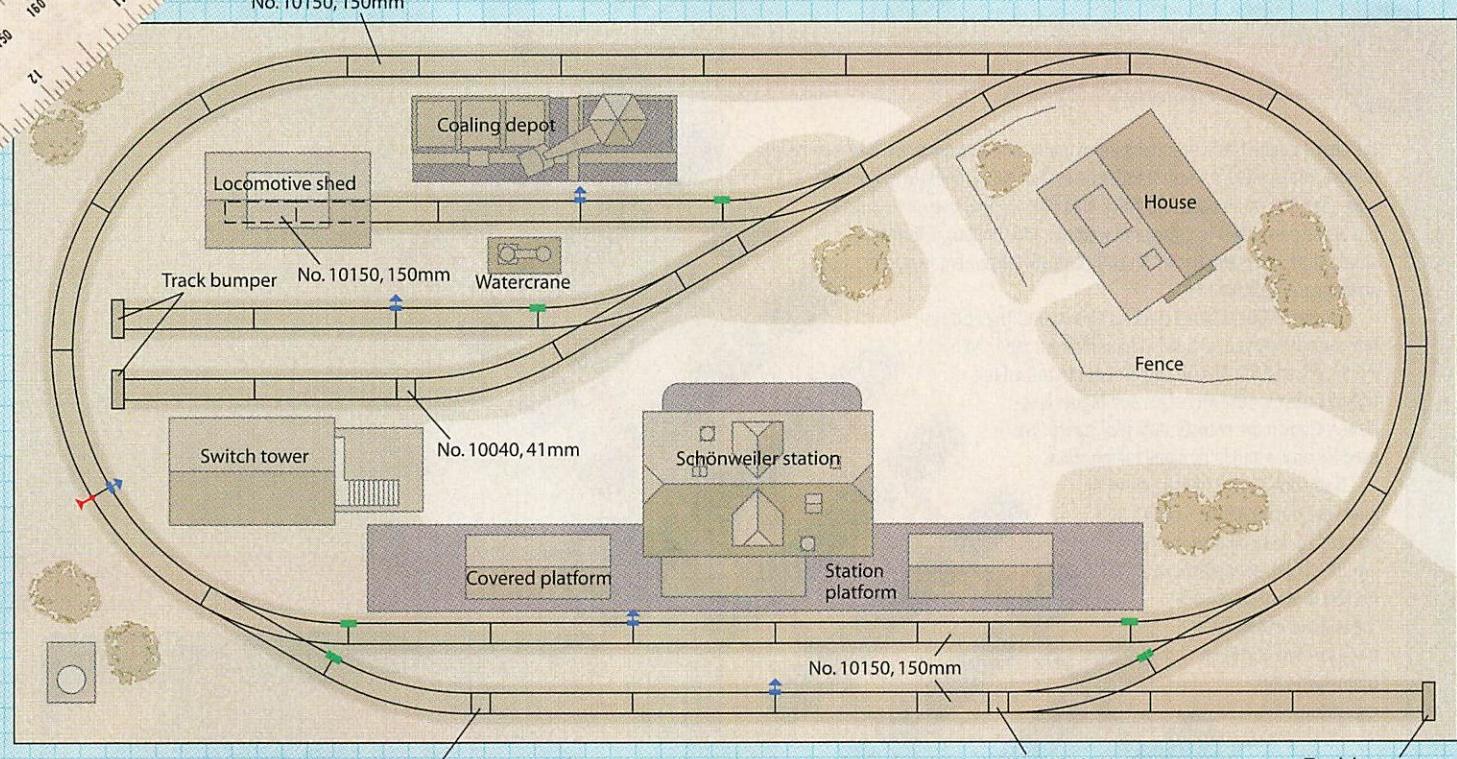
MÄRKLIN

Code 197 stainless-steel rail with dark brown plastic ties

USA TRAINS

Code 332 brass rail with black ties

* "Code" is the height of the rail in thousandths of an inch.



G scale
Scale of plan: $\frac{3}{4}$ " = 1'-0"
Size: 5 x 10 feet

No. 10040, 41mm

Unmarked straight sections: no. 1000, 300mm straight
Unmarked curved sections: no. 1100, 30°, 600mm radius
Unmarked turnouts: LGB no. 12000 (right) or 12100 (left)

No. 10150, 150mm

Track bumper



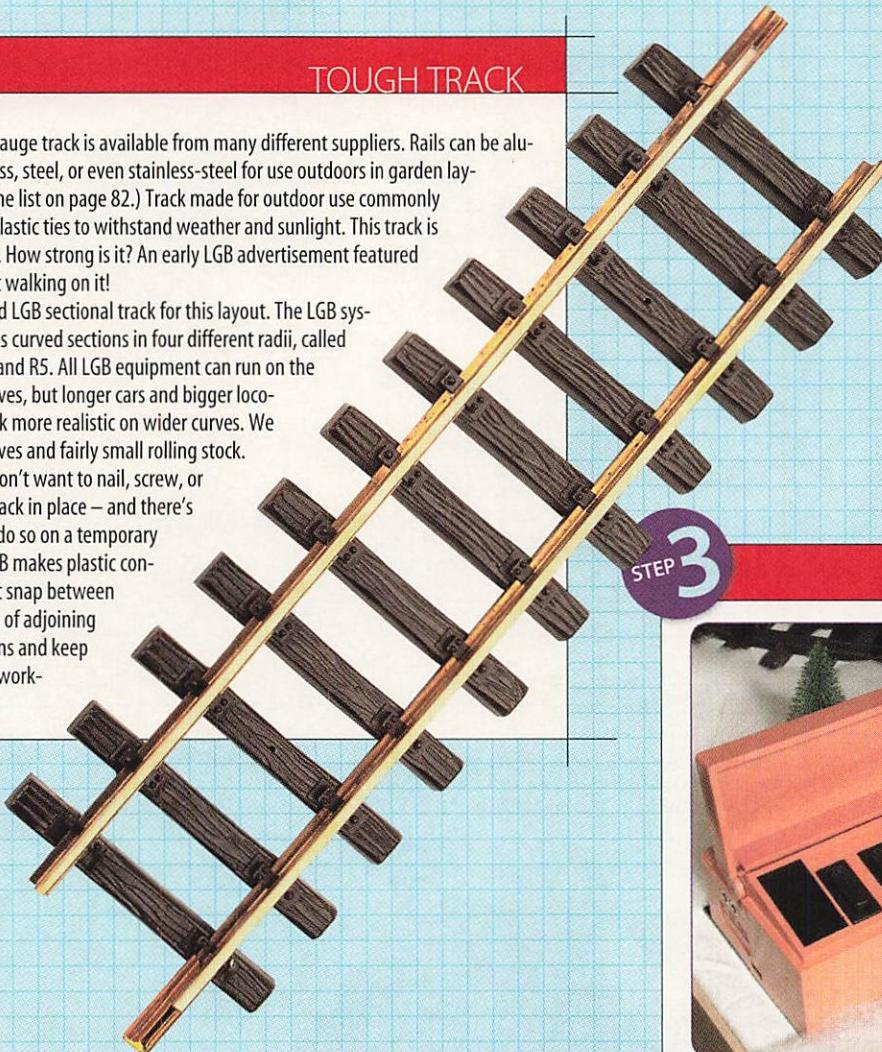
STEP 2

TOUGH TRACK

Number 1 gauge track is available from many different suppliers. Rails can be aluminum, brass, steel, or even stainless-steel for use outdoors in garden layouts. (See the list on page 82.) Track made for outdoor use commonly has acetal plastic ties to withstand weather and sunlight. This track is sturdy stuff. How strong is it? An early LGB advertisement featured an elephant walking on it!

We used LGB sectional track for this layout. The LGB system includes curved sections in four different radii, called R1, R2, R3, and R5. All LGB equipment can run on the tightest curves, but longer cars and bigger locomotives look more realistic on wider curves. We used R1 curves and fairly small rolling stock.

If you don't want to nail, screw, or glue your track in place – and there's no need to do so on a temporary layout – LGB makes plastic connectors that snap between the end ties of adjoining track sections and keep them from working loose.



STEP 3

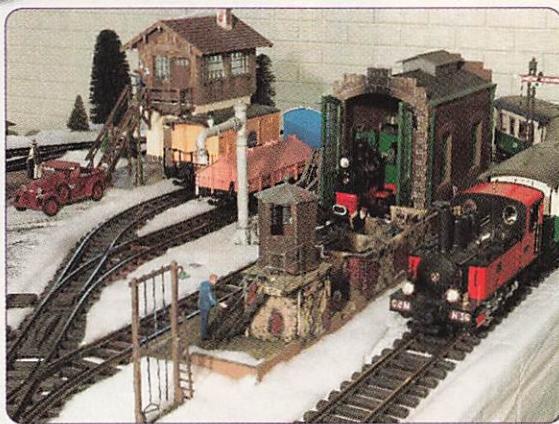
ELECTRICAL CONTROL



We used a standard LGB 1-amp power pack to power our railroad, and we strategically placed insulated track joiners to create electrically isolated areas to "park" locomotives while another one takes a turn on the main line. An LGB control box with toggle switches controls power to the isolated areas, but simple toggles from RadioShack would work just as well for an indoor railroad.

STEP 4

BUILDINGS AND STRUCTURES



The buildings on our railroad are European-themed G scale Pola structures. Pola buildings are sold in kit form and must be assembled. However, assembly goes quickly – the kits even include glue – and the buildings are factory-painted, which pretty much guarantees great-looking results right out of the box.

With kits this big, you'll find yourself using larger tools than with other scales. A 12" file is a great help, as are some quick-grip bar clamps.

Interestingly, some of Pola's buildings, such as the station, are designed to be partially disassembled for storage.



With our track and buildings in place, it's time to add the finishing touches that bring this railroad to life. We used pieces of white polyester quilter's batting, purchased from a fabric store, to represent deep snow. A little goes a long way — one roll was all we needed for our 5 x 10-foot winter scene. We simply cut and fit the batting wherever piled-up snow seemed likely to be. You'll need to make sure the batting doesn't get too close to passing trains — we didn't, and our first train snagged our "snow" and took it for a ride!

For our roads, we used the plain white sheet covering the plywood table and sprinkled on Woodland Scenics ballast for texture. If you want to save the ballast when you take down your layout, vacuum it up with a clean shop vacuum and pour it into a storage container.

We also added plenty of G scale figures. Adding scale people is a great touch for any layout and is particularly effective in G scale — those big passenger platforms and workshops look empty without them. You can hold the people in place with an adhesive gum like Duco Stik-Tak.

ONE TRACK, MANY SIZES

Large scale trains operate on rails spaced 1.77" (45 mm) apart, also known as No. 1 gauge track. While the width between the rails remains the same, the size of the trains vary. LGB uses No. 1 gauge track to depict a European narrow gauge railroad with meter-gauge track, which is why LGB's traditional proportions are 1:22.5. Other manufacturers use No. 1 gauge track to represent standard gauge railroad track or other narrow gauges and proportion their trains accordingly. Generally speaking, a narrow gauge locomotive is going to be taller and wider on No. 1 gauge track than a standard gauge locomotive.

ARISTO-CRAFT

1:29 proportion standard gauge
1:24 proportion narrow gauge

BACHMANN

1:20.3 proportion 36" narrow gauge

LGB

1:22.5 proportion meter narrow gauge
1:26 proportion standard gauge

No.1 SCALE

1:32 proportion standard gauge

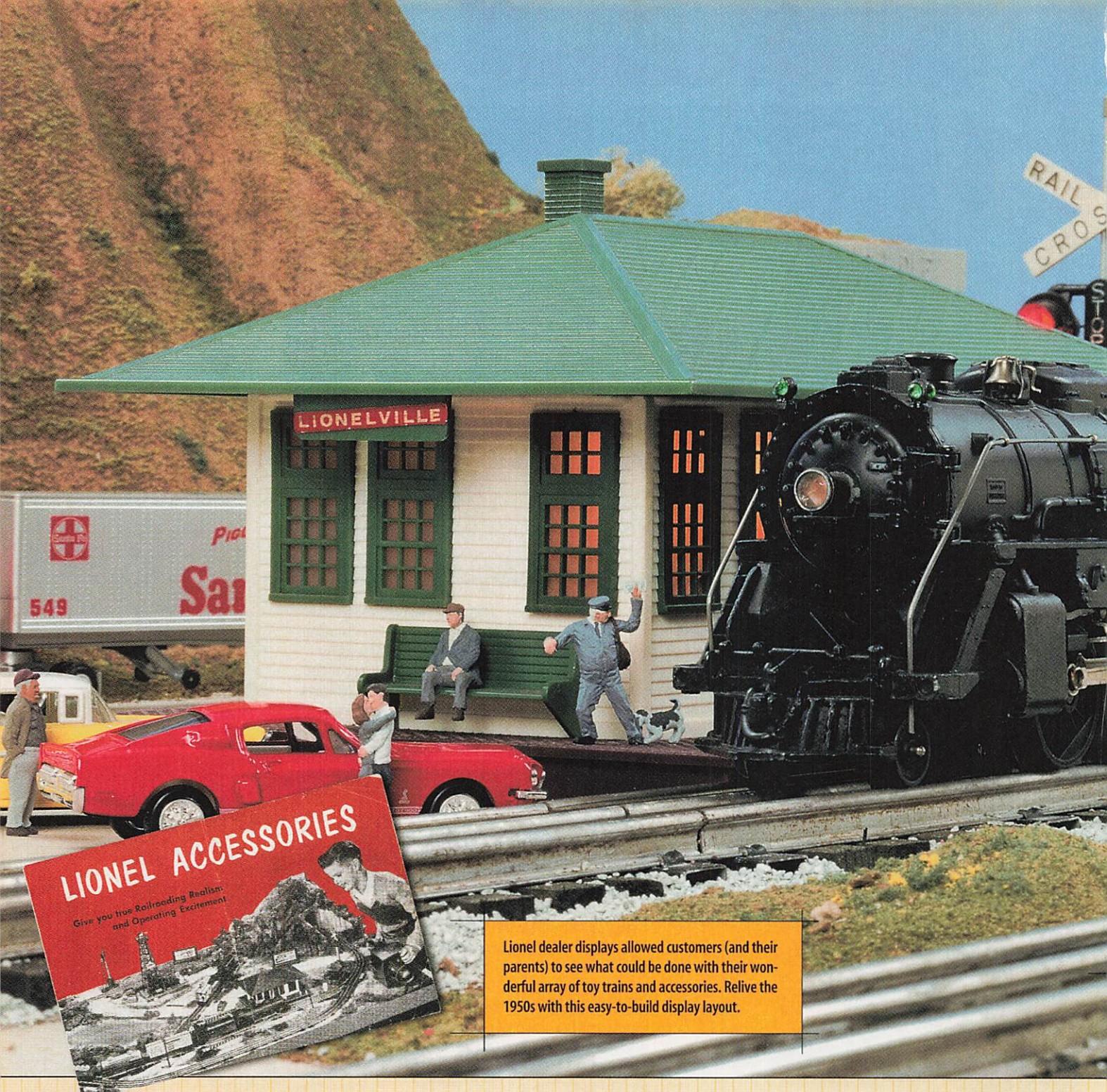
MARKLIN

1:32 proportion standard gauge

USA TRAINS

1:29 proportion standard gauge
1:24 proportion, 36" narrow gauge

Note: The different proportions come from adjusting both standard and narrow gauge prototype proportions so the wheelsets will fit No. 1 gauge track. #



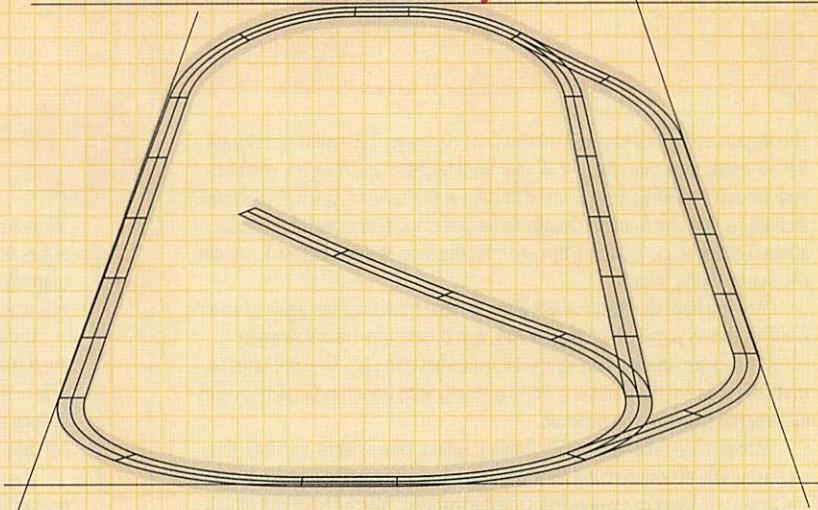
Lionel dealer displays allowed customers (and their parents) to see what could be done with their wonderful array of toy trains and accessories. Relive the 1950s with this easy-to-build display layout.

Build a dandy layout with **postwar style**

You can easily make an O gauge layout with a 1950s store display look



The Lioneltown Belt Railway



GAUGE:
O
CONTROL:
AC POWER PACK
SIZE:
4'x8'
SETTING:
AMERICAN MIDWEST

Not so long ago the center of the model railroad calendar was roughly November through January. Today, memories of seasonal store train displays can cause men and women, well into middle age, to get a bit misty eyed when they recall that trip to the hardware or tire store's train department. There was something enjoyable about those display layouts sold to retailers to help generate holiday revenue. They were simple, featuring a few switches for varied operation, often an elevated

loop, and a range of accessories and structures to help break up the terrain, and to inspire kids to add "just one more" item to their gift list. Many enthusiasts have re-created what they might have seen in their local hobby shop.

The staff of *Classic Toy Trains* magazine built a postwar-style display layout using modern trains and accessories available from Lionel or its competitors. After all, there's still something special about running trains, particularly when the layout was designed by Lionel.

STEP 1**TRACK AND ROADBED**

This layout uses standard Lionel tubular O-31 (0 gauge, 31"-radius curve) track. Before you do anything else, put all your track together and measure what fits and the exact dimensions you'll need to cut. For this railroad, you'll need some 6" straight sections cut from full-length sections of track. (For more information about O gauge track, including tips on trimming tubular three-rail track, see our chapter on laying track.)

Once you have the custom work done, put the track together again to ensure it all fits. Unless you like loud train noises, don't screw that track down yet!

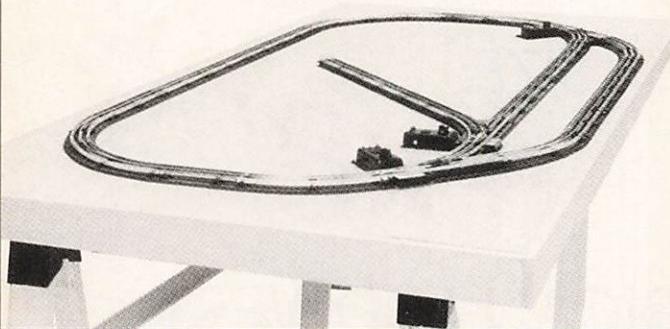
At this point, this is where cork roadbed comes into play. The cork helps to mute the sound of the trains – it works perfectly with Lionel sectional track and looks better than track on plywood.

Once you have your track in its proper position, take a pencil and draw lines on the outside of both running rails. When you move the track, your nicely traced track plan will show you where to install the roadbed. Pull the track and draw a center line between the ones you just traced. This new line will act as a guide for gluing the two cork roadbed sections together.

The roadbed comes with a diagonal cut; simply pull the two sections apart. Lay the newly separated sections together with the diagonal edges to the outside, and just like magic, instant beveled roadbed!

Work with one cork half-section at a time. We used yellow carpenter's glue to attach the roadbed to the plywood. It provides a strong, lasting bond, but as it dries, you may want to use small nails or pushpins to hold the cork in place, particularly on the curves. Remove them when the glue has dried.

When you have the entire track plan corked, put your track on top and use a few screws to temporarily hold things in place. And yes, it's time to run some trains. In a flash, you'll notice how the roar of the locomotive has displaced the reverberation of the plywood's many glued layers.

**STEP 2****SCENERY**

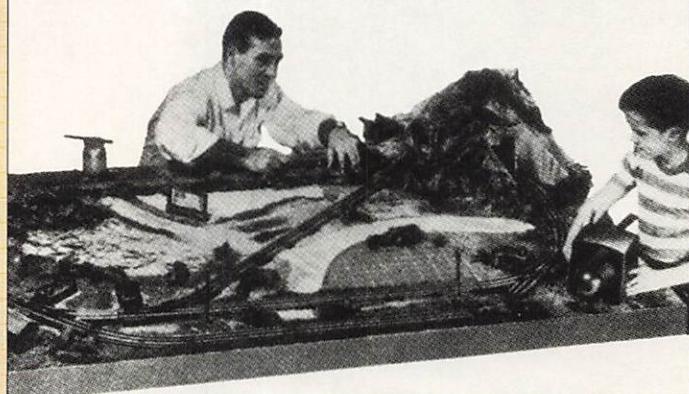
With the layout wired and in full operation, the next step is the one that really makes the difference, scenery. The basics of scenery are covered in our scenery chapter, but we also used a few nifty touches of our own to give this railroad the look of a real postwar display layout.

Using a permanent marking pen, outline the roadway location, the lake, and the station placement on the painted plywood. Don't worry if your lines go askew here or there – everything will be covered up. We used original 1953 photos, like the one below, to help determine the rough placement of the various elements. Feel free to change things around. Model railroading is not for lemmings!

The scenery technique we used requires a grid of interwoven $\frac{1}{2}$ " strips cut from old cardboard boxes, woven together and attached with either white or yellow glue, or hot glue-gun adhesive. By bending the strips into various angles and weaving them together, you'll soon produce a rough outline of what the finished land forms. Don't worry that it doesn't "look good." It'll soon be covered up.

Make sure you include some scenery for every section of the layout that isn't going to become a roadway, lake, or mountain (that's next). If you leave it plain, you may as well get some race cars and call it the Bonneville Salt Flats, because that's what it'll look like.

One additional note: place and wire your accessories (particularly the Automatic Highway Flasher, Crossing Gates, and Oil Derrick) in their final resting places at this point in the process. Otherwise, later on you may find it difficult to find some flat, level terrain for them.

**STEP 3****TUNNEL CONSTRUCTION**

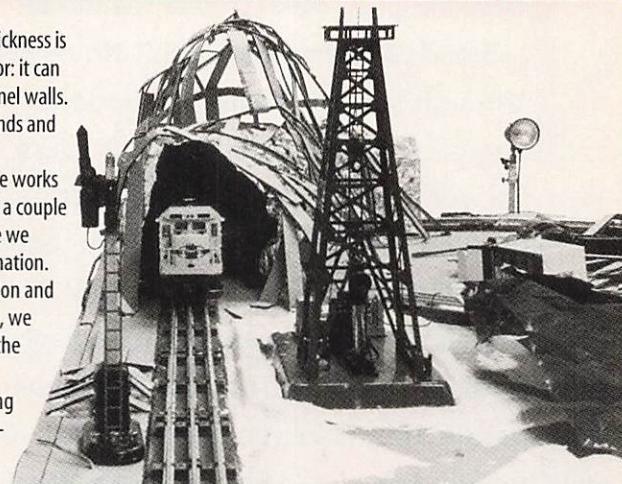
We built our mountain inside-out using heavy-duty aluminum foil (regular thickness is too malleable for our purposes). Heavy-duty foil makes a perfect tunnel interior: it can withstand some bumping, and when lightly distressed, it looks like rough tunnel walls.

We started by texturing the foil. Hold an 18"-long sheet between your hands and play patty-cake with it; this makes creases and folds, but doesn't tear the foil.

We took some black spray paint and found a well-ventilated area (outside works well for those of us who don't own a spray booth). We found that we needed a couple of coats to get decent coverage. Next we found the largest, tallest locomotive we owned, placed it on the track, and bent the foil around it in a tunnel-like formation.

When it comes to producing the tunnel's curve, we mimicked an accordion and bent some folds on the inner curve. When we were satisfied with the results, we glued the sections together and then glued the entire assembly down onto the plywood. We used three sections to cover the entire length of our tunnel.

With the interior of the tunnel formed, we moved on to Step 4: covering the foil with cardboard strips and plaster gauze, as seen in the accompanying photo.



MATERIALS

LIONEL (track)

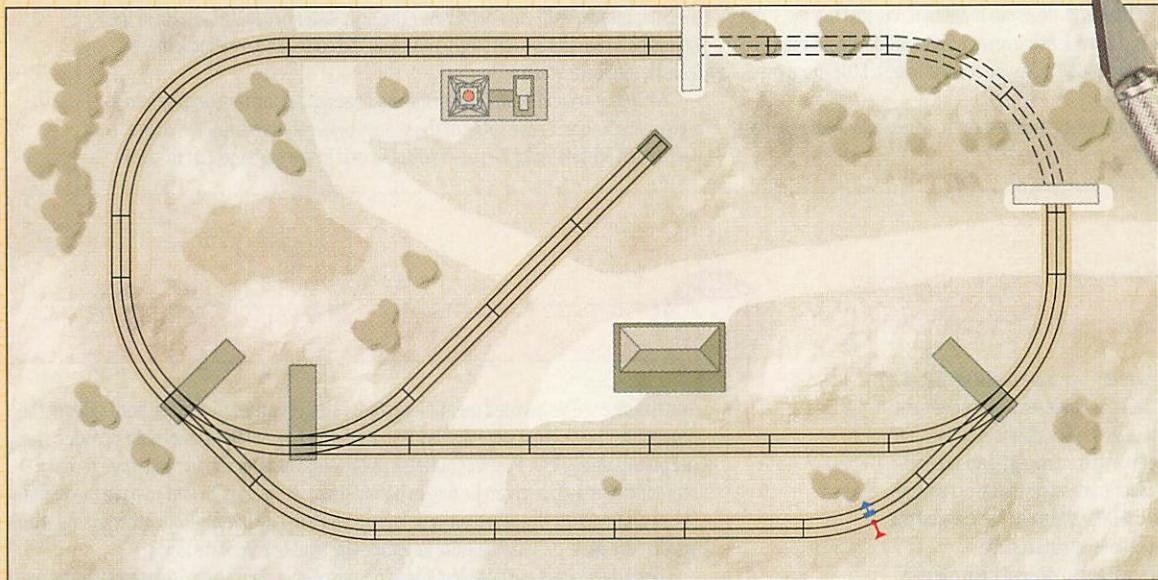
- 14062 O-31 switch, left (2)
- 14063 O-31 switch, right (1)
- 65500 10" straight (12)
- 65501 O-31 curve (8)
- 65505 5" half straight (3)
- 65530 UCS section (1)

LIONEL (accessories)

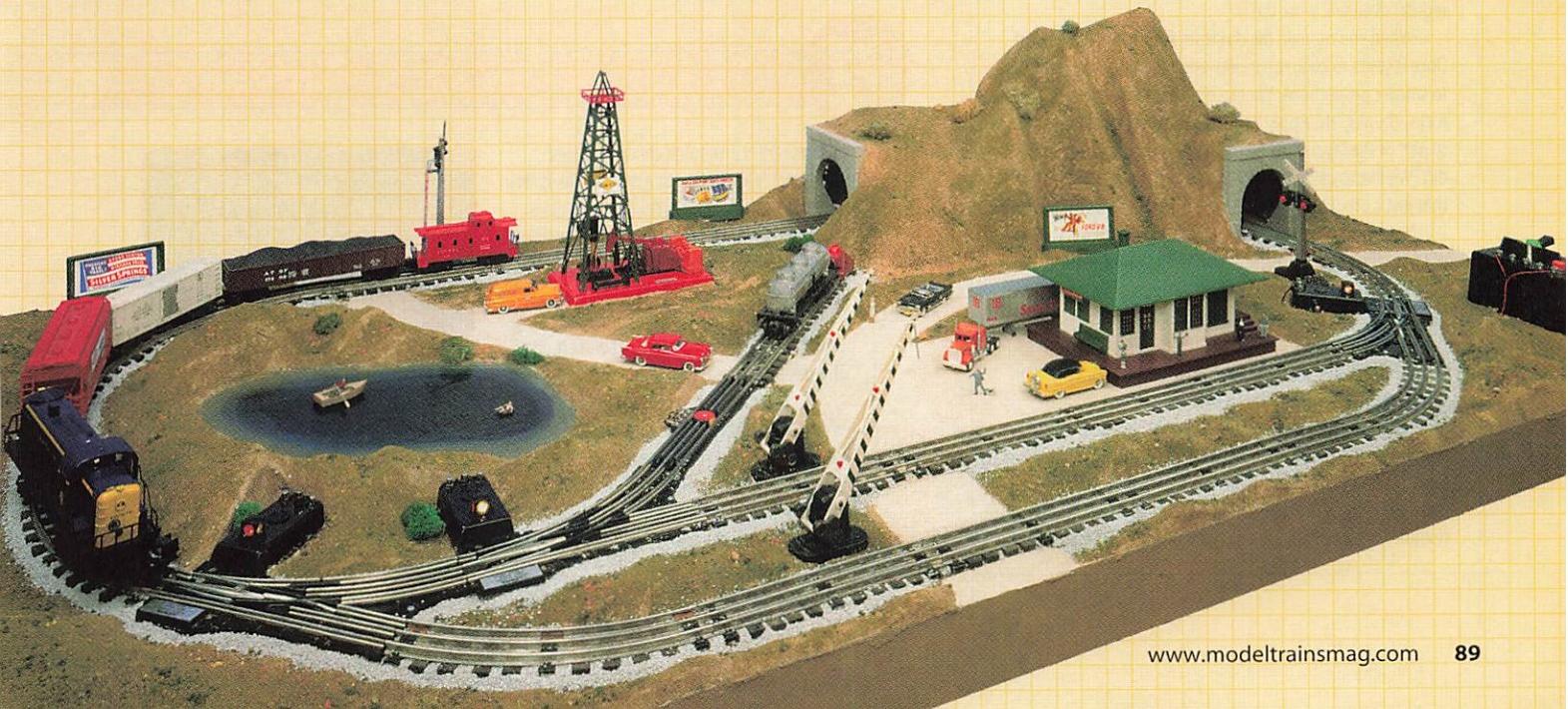
- 12714 crossing gates (2)
- 12888 highway flasher (1)
- 14121 billboard set
- 14152 station (1)
- 22944 semaphore (1)
- 32990 oil derrick (1)
- 62283 die-cast bumper (1)

OTHER MATERIAL

- 22 gauge wire
- ground foam (fine, medium and coarse)
- gloss medium paint
- glue and hot-glue gun
- plaster cloth (20 rolls)
- Sculptamold (10 pounds)

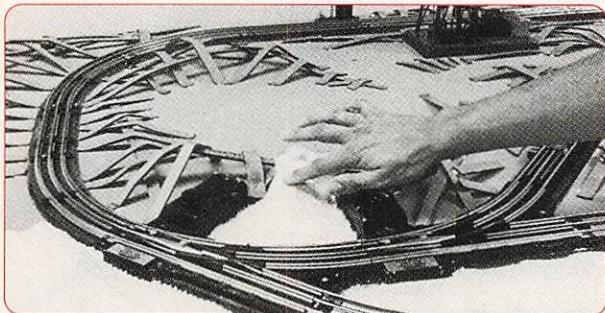


O Scale
Scale: $\frac{3}{4}$ " = 1'-0"



STEP 4

MOUNTAIN CONSTRUCTION



We needed some fairly long strips of cardboard to create the mountain that covers our tinfoil tunnel. Take our advice: the more you worry about the mountain's shape, the worse it will look. Just go for it.

We sloped the bottom strips outward in the direction of the road, not worrying too much about the backside of our mountain. We just ran the strips down to the edge of the plywood, leaving an almost vertical face. Of course, if your layout can be viewed from that side, you'll want to be a little more creative back there than we were.

The next step involves plaster-permeated cloth, which is available in most well-stocked hobby shops.

Buy several rolls of the stuff and cut it into 4" to 6" segments. Cut four or five (or more) segments at a time. Get a full pan of warm water. Dip one strip into the warm water briefly. The plaster softens after 10 to 15 seconds, and the plaster cloth is ready for application.

Pull a segment out of the water and lay it over the lattice of cardboard strips. You'll need only one thickness, so don't worry about double coverage. However, you will need to overlap the segments. When you do get two segments of plaster cloth, smooth out the joint with your finger. The plaster will fill any inconsistencies nicely. Be sure to cover your track and switches before you bathe them in a wash of plaster-filled water.

Cover every part of the layout with cardboard strips. Plaster cloth dries to the touch in about 15 minutes, but we suggest waiting overnight before attempting the next phase. Make sure you discard your old water outside. Pouring it down the drain will only help further the plumbing trade.

When the gauze has dried hard, get a pan, add no more than two cups of Sculptamold and some water. The ideal consistency is that of oatmeal. Apply the Sculptamold with your hands over the dry plaster gauze surface. Fill in the valleys between the woven strips, rounding the edges and creating a more-realistic terrain as you go.

With your second coat, concentrate on floating out the topography into a more realistic look. Leave some of the valleys between the strips. We didn't need much Sculptamold. Be sure to dispose of it in the garbage, not the sink.

STEP 5

FINISHING THE SCENERY

When the Sculptamold was dry, we gave it a base coat of brown flat latex interior paint. It produces a nice undercoat that has two functions: It seals the Sculptamold surface and provides an undercoat for the upcoming dirt-and-ground-foam application. Don't paint track, accessories, or switches, unless you like them brown! Once the paint has covered the Sculptamold, we can get serious about scenery.

We'll start with some real dirt, gathered from the garden or driveway. Bring it to your microwave. Yes, it's "meet the maker" time for the microbes inhabiting your sample. Put the dirt in a microwave-safe dish, and let it cook for a couple minutes on high. If you don't have a microwave, a regular oven will work too.

When you remove the dirt from your oven, it'll be hot! Once it starts to cool, rub it between your fingers to reduce it to smaller proportions. We like dirt that's virtually free of rocks, chunks, etc. Apply a thick coat of earth-colored paint to part of the layout. While the paint is wet, sprinkle on the dirt. We like to cover most of the surface with the dirt so that just a bit of the painted undercoat shows through.

Note, however, you don't need to try to do everything at once. This stage of construction will take some time, but it's also a lot of fun. When your first attempt has dried (in a few hours), you'll marvel at how realistic it looks.

Try using those small rocks you previously sifted out of the dirt. They add nice highlights to spots on your terrain. Any other little details you can think of — small shrubs, lichen (heavily used on the 1953 version), and trees — are welcome additions. Installing ballast is an excellent finishing touch. The same principles that work in N or HO gauges (see page 79) work in O. You'll just need to make sure that the texture and size of ballast look good on your O gauge layout.

STEP 6

TUNNEL PORTALS

You'll notice we've avoided mentioning those Lionel portals that grace both sides of the mountain. The original store display layouts didn't have them. Lionel didn't produce tunnel portals until 1957. Postwar portals can be found at train shows, and more recent reproductions by Lionel can be had in hobby shops. If you don't want to have the Brand "L" so prominently displayed on your layout, you can buy portals from other manufacturers that are plain or which feature keystones instead of corporate logos.

Once the portals are installed, finish off the plaster gauze and Sculptamold right up to them, being careful not to paint them. Then scenick the areas just like the remainder of the layout. It really makes the difference!

STEP 7

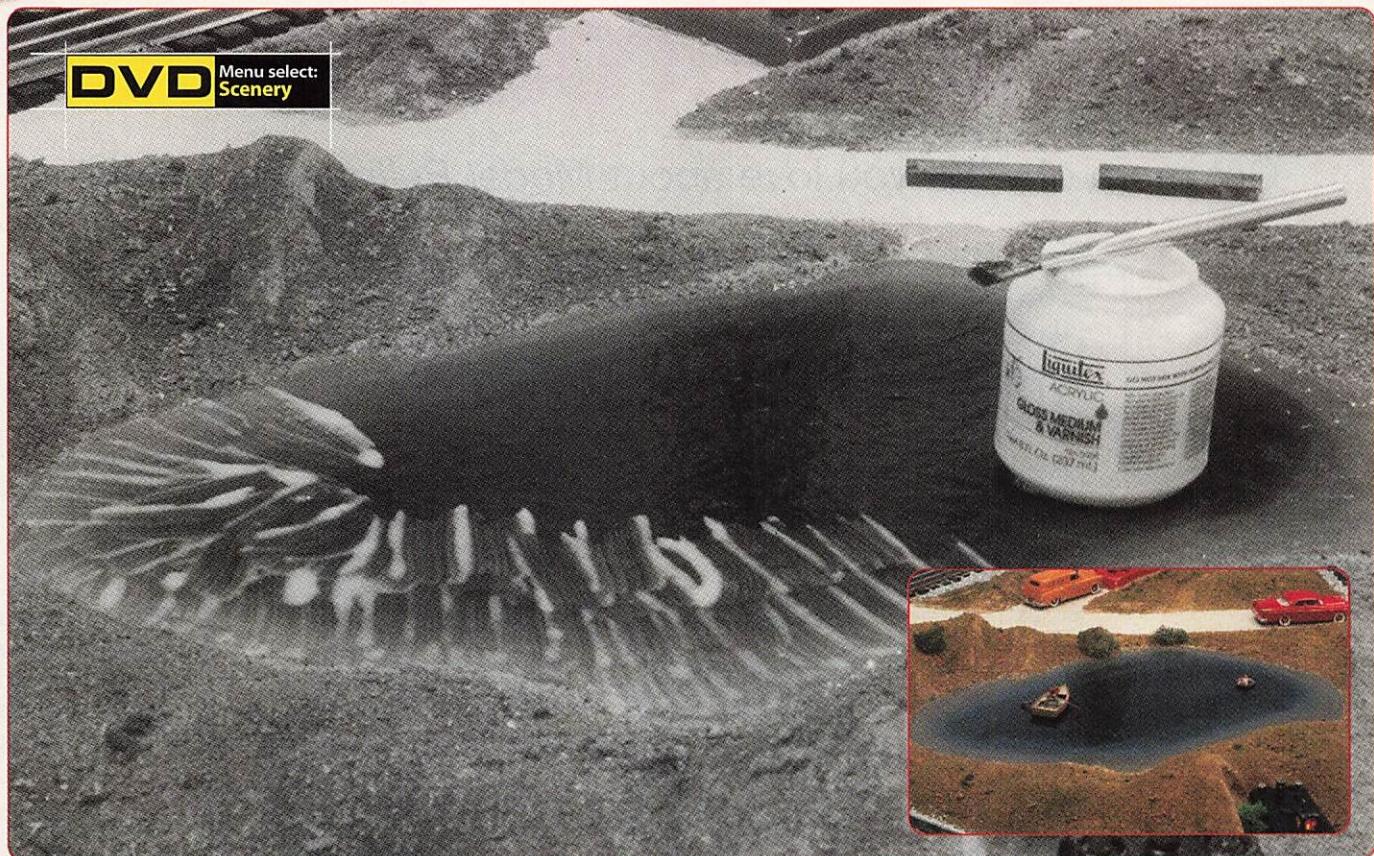
USING SCALECRETE

ScaleCrete is a genuine concrete-based product. It's applied with a putty knife, is relatively workable for a period of time, dries hard, and looks like real concrete. In addition, it's inexpensive and easy to use. You can find ScaleCrete at your local hobby shop.

I put a thin layer of ScaleCrete on the plywood surface for roadways and work it up to the scenicked areas and grade crossings.

As with Sculptamold, you shouldn't worry about appearance with ScaleCrete, because a second coat (if necessary) is only a couple hours away. However, you'll find it a fairly forgiving substance to use as long as you use your knife steadily and don't get any foreign matter in it.





The lake seems imposing, but building it is really very easy. First, clean off any residual Sculptamold that may have dripped in the lake area. Then get three colors of paint; we used black, dark blue, and light blue. Painting three concentric circles (darkest in the middle, lightest on the edge) then blending slightly with a brush goes a long way to suggesting depth.

Once you've got your lake painted, grab a jar of acrylic gloss medium. It looks a lot like water, adds an illusion of depth, and covers a world of sin. Best of all, it's easy to use.

Start on the edge of the lake and brush inward, applying the gloss medium very liberally. The gloss medium looks milky white when applied, but it will

dry to an almost clear finish. Once you've gone around the entire lake, swirl the brush around and add "currents" and "whitecaps." Gloss medium takes approximately an hour to dry. Repeat this procedure a number of times until you're satisfied with the finish and the illusion of depth is, well, illusory (we did about 10 coats).

THE CONTROL PANEL

The original layout featured a ZW transformer, but this is a pretty simple layout that doesn't need 200 watts. A more-modest power supply will do, and we used an old LW transformer. You can use virtually any new or vintage AC power supply.

We left the front right corner more or less level to make installing the transformer and various controllers easier. If you decide to make this area a ski run on your layout, well, you've got yourself a challenge.

Using a knife, we traced around the controllers and transformer, cutting the finished scenery. When we put them into their slots,

the effect was perfect: the transformer and controllers look like they belong there. If we had just placed them on top, it wouldn't have been the same.

Make sure you cut around the items tightly. This will make installing them easier, and you won't have to screw them down because the scenery will hold them in place. If your knife careens off and slices a big chunk out, no problem—glue it back in and wedge your controllers in place.

Drill holes through the plywood to connect them to their respective turnouts and to any accessories you've installed. #



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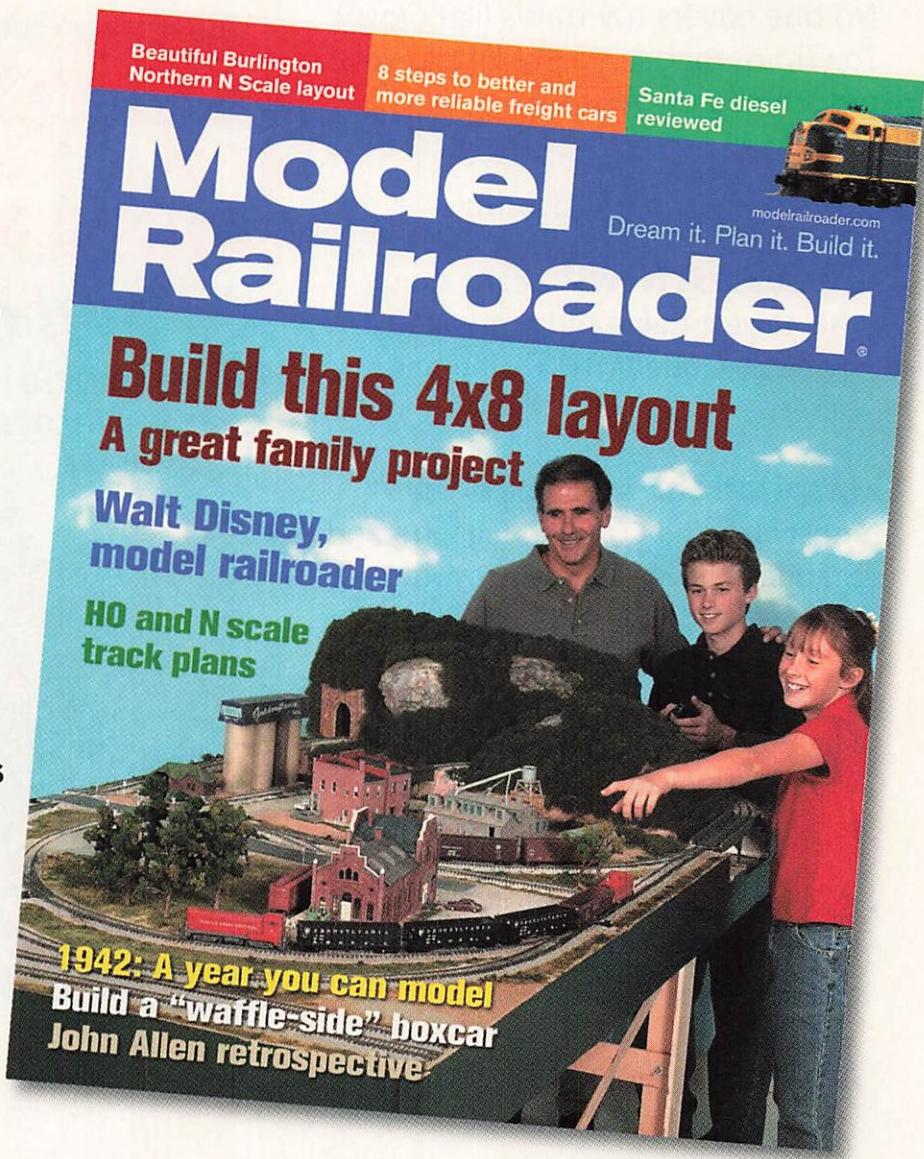
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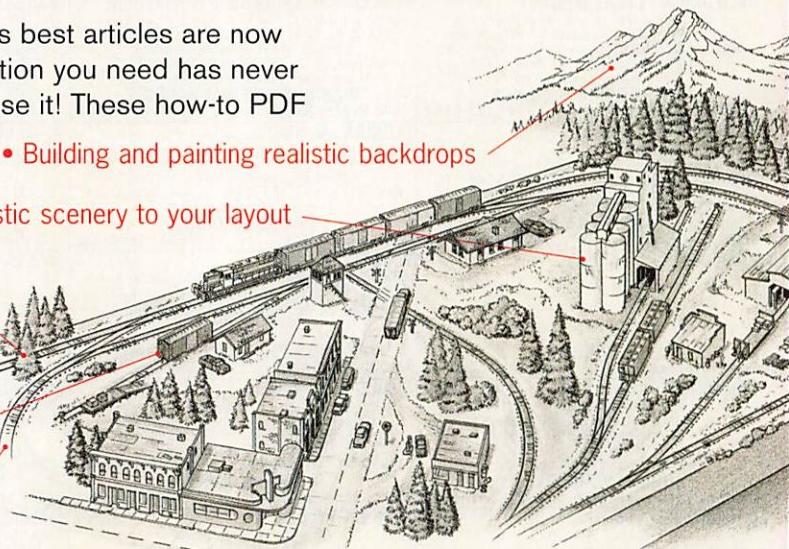
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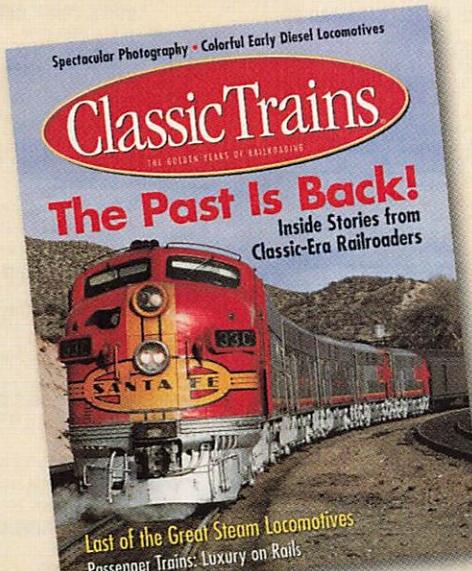


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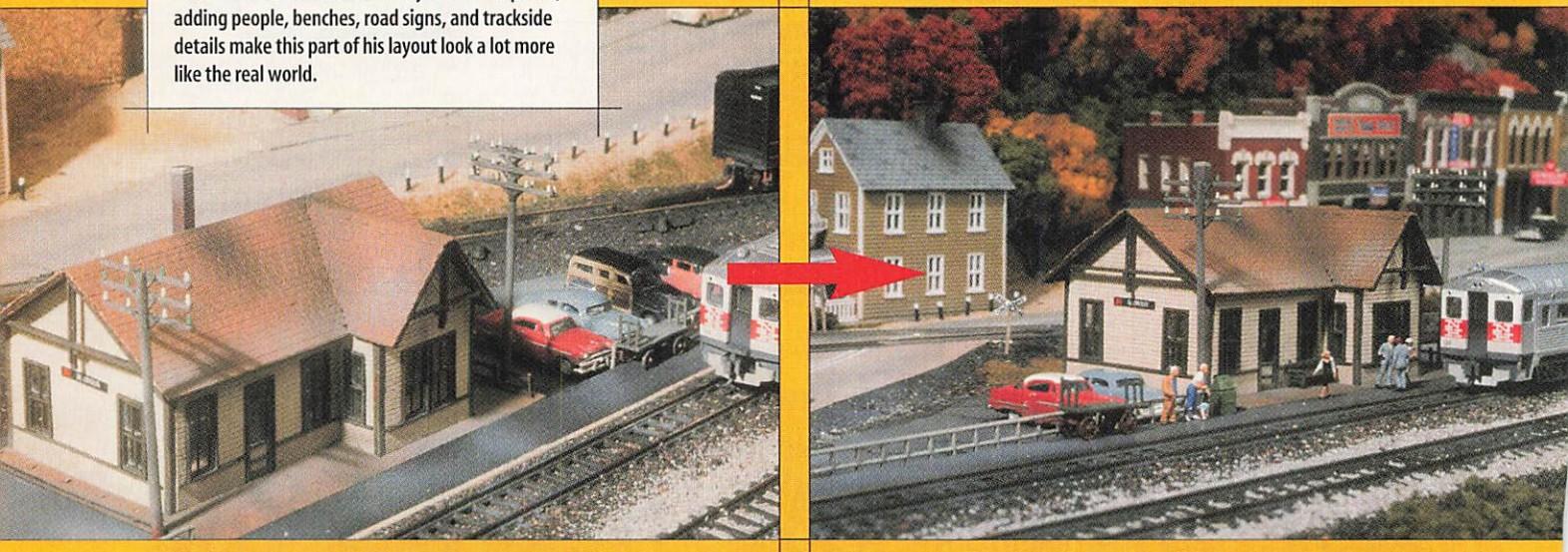
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The next step?

by David Popp

These photos show a before and after glimpse of a scene on David's N scale New Haven layout. Though he had finished the basic scenery in the first photo, adding people, benches, road signs, and trackside details make this part of his layout look a lot more like the real world.



So you've built your benchwork, laid the track, and wired your layout. You've also assembled some structure kits, made your own rocks, and planted a small forest full of nice trees. Maybe you've even added a picturesque river and a few bridges. After completing all that work it's time to give yourself a well-deserved break, run some trains, and enjoy your new layout.

Sooner or later, though, you'll probably start looking around for that "next step." Where does one take a layout from here? Not surprisingly, the next step depends a lot on what you want to get out of the hobby. Though there are several good avenues you could take, perhaps the best leads to *Detail City*.

If you've completed all the things discussed in this book, when you step back and look at your layout from a distance, it'll probably strike you as being amazingly realistic. Your stations and towns look like places you could actually visit. Model railroads, after all, are meant to capture part of the world in miniature.

However, if you take a closer look you'll begin to get the feeling that something is wrong. Your model world looks too neat and clean, giving you the impression that no one really lives or works there. This is where "the detailing step" comes into play. Finishing details are the breath of life for a model railroad.

There seems to be an almost infinite amount of detail you can add to a layout. Let the outside world be your guide and you can't go wrong. Details include everything from the obvious such as billboards, business signs, cars, and people, to smaller, easy-to-miss items like a dog, a

mailbox, or an old tire used as a tree swing. The best part is that there's a multitude of commercial layout detail parts to choose from. And, you can also make a lot of details yourself, right at your own workbench.

Since the outside world is filled with a whole lot of stuff, finding a place to start detailing can seem a bit overwhelming at first. Fortunately details have a way of multiplying all by themselves. For example, it doesn't take more than a few people loading boxes into a truck outside a warehouse to convince most viewers that the warehouse is full of boxes and workers. One truck, a small stack of boxes, and a couple of well-placed figures create the illusion that there are more where those came from, making your job a lot easier.

My favorite rule of thumb when adding details is to work in small areas to create a scene that tells some sort of story. Placing a car with its hood up along a roadside could be a good start. Adding two figures looking at the car, let's say a man and a woman, adds a bit of intrigue. Having the woman working under the hood while wearing a wedding dress and the man dressed in a suit standing bewildered nearby adds a touch of humor, drama, or both!

Again, like the boxes, this scene is a simple one, including one automobile and two figures. You could dress it up a bit more by adding a "just married" sign to the back of the car and a toolbox, but that's all you'll need. Suddenly what was once a stretch of empty highway has become more realistic by adding this human element.

Don't stop there, however. There's a whole host of lineside details you can add to your right-of-way to make

your railroad look more authentic. Things like crossbucks or crossing gates, line poles (telephone poles), whistle posts, and mile markers are all common mainline sights. At one spot you could place a few culverts, piles of surplus ties, and neat stacks of 39-foot sections of rail to simulate a track gang's supply of materials. Phone boxes, signal relay cabinets, battery wells, and block signals are also good railroad features. Photos of real railroads are a great place to find ideas and examples for these details.

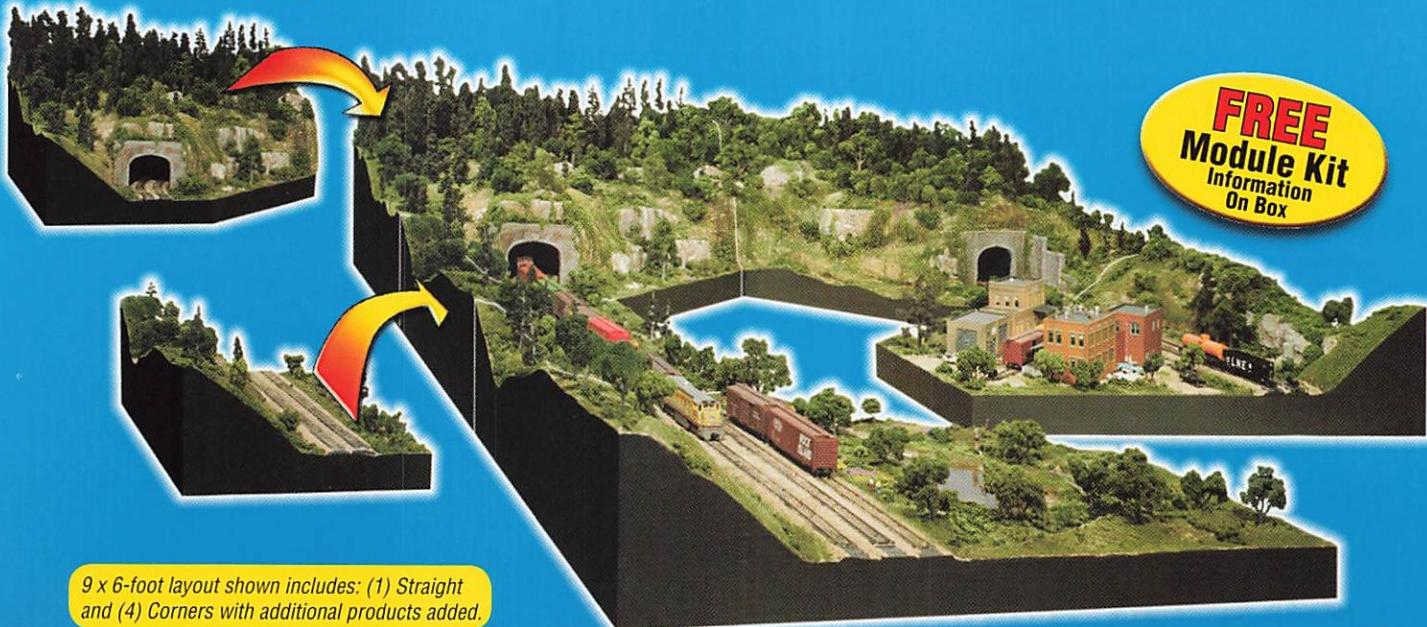
And when your towns, roads, and main line have been detailed, you can start on the trains themselves. There's a host of after-market detail parts, including scale-sized knuckle couplers, eyebolts, handrails, windshield wipers, hoses, air horns, and much more that you can add to your locomotives to make them look more like their real-life counterparts. Working with paint or colored chalks, you can make your cars and locomotives look aged and worn using a technique called "weathering." And don't forget crews for your engines and patrons for your passenger cars — you shouldn't have your railroad equipment running empty.

There's an old saying that a model railroad is never truly finished. With all the possibilities that detailing has to offer, that may be true. Keep in mind that when you're satisfied with how your layout looks, there's always expansion. Most all the track plans we've presented here have a track or two that leads off the edge of the train table. (My wife worries every time she sees that feature on one of my layouts!) When you are ready for your next construction project, take what you've learned here and forge ahead into exciting new model railroad territory. ■

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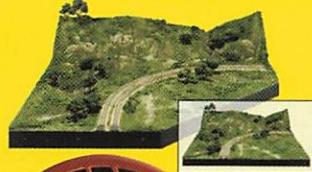
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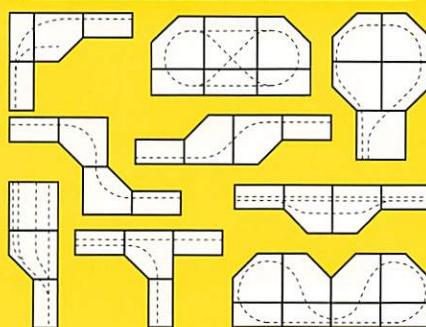
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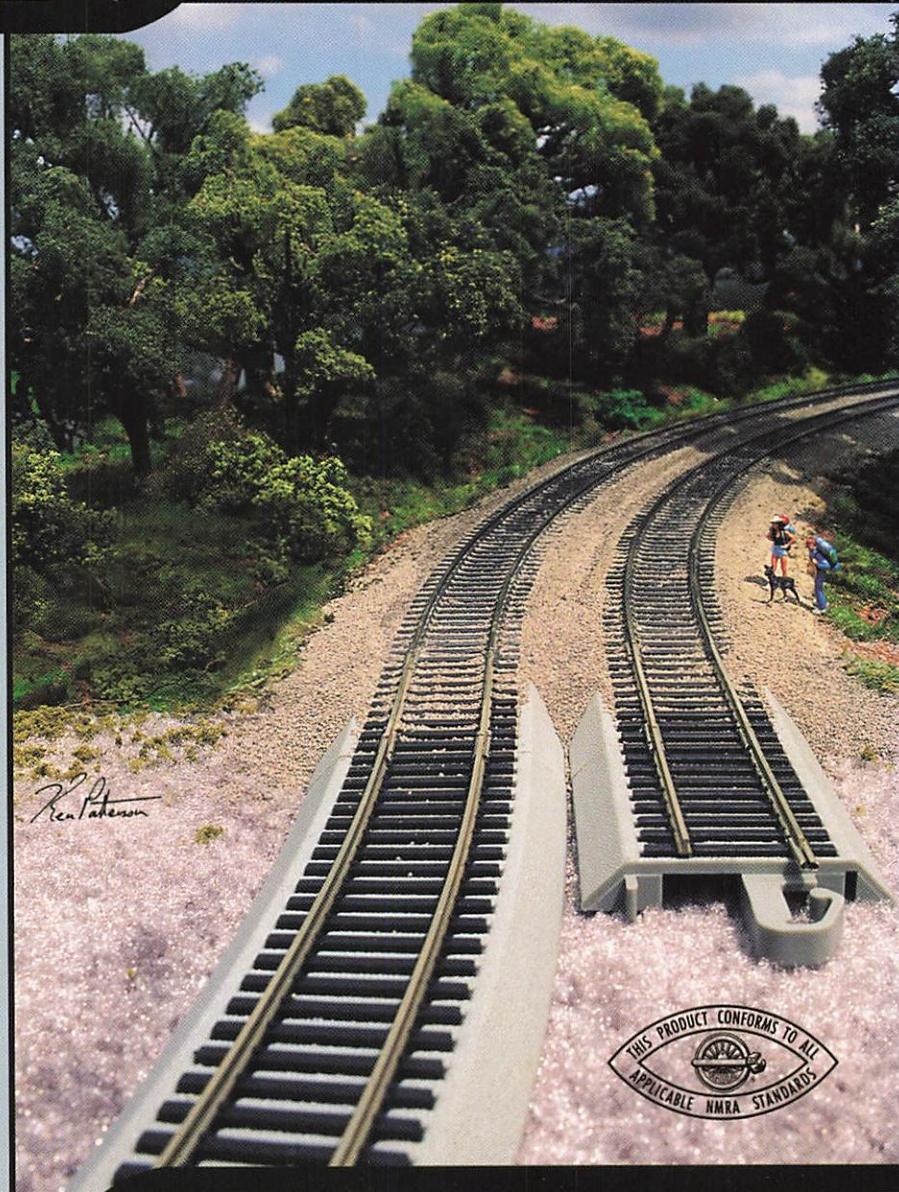
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